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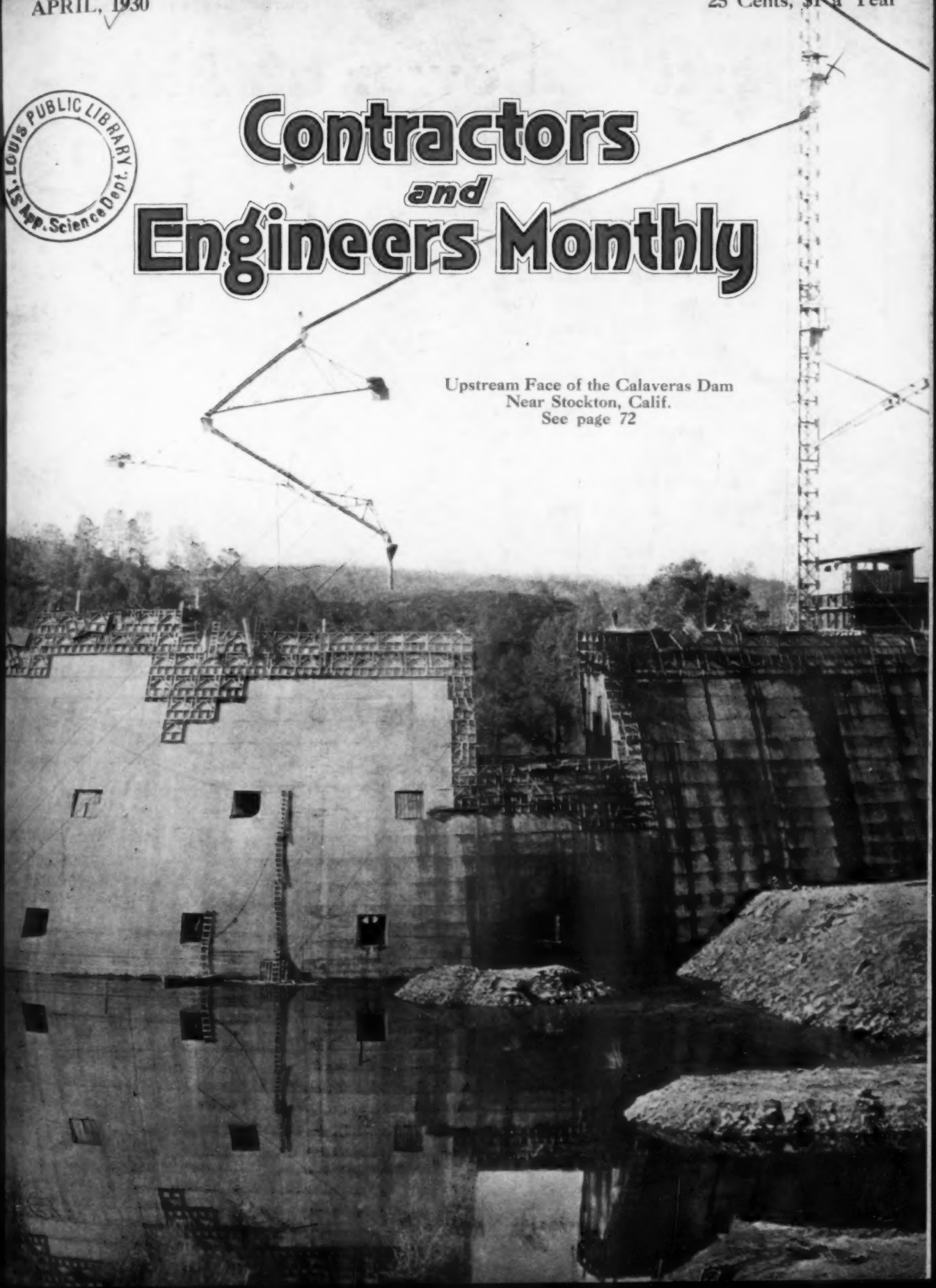

Upstream Face of the Calaveras Dam
Near Stockton, Calif.
See page 72

Hercules Power an Aid to Modern Logging

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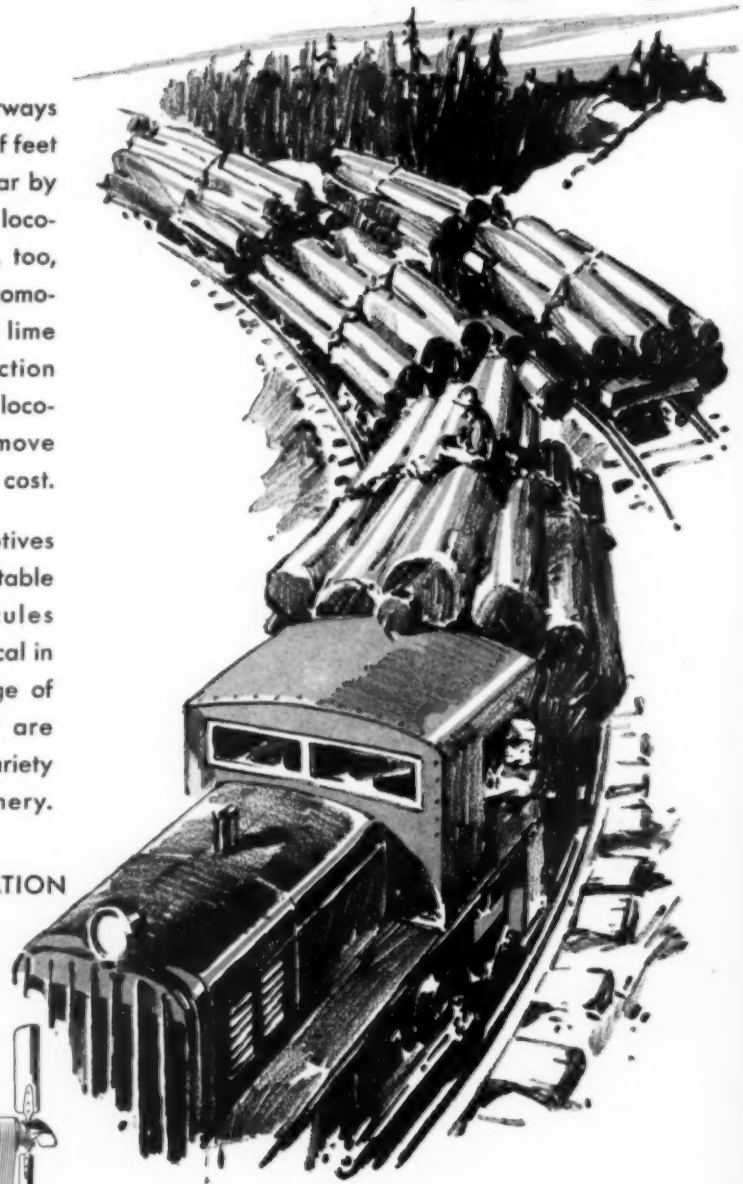
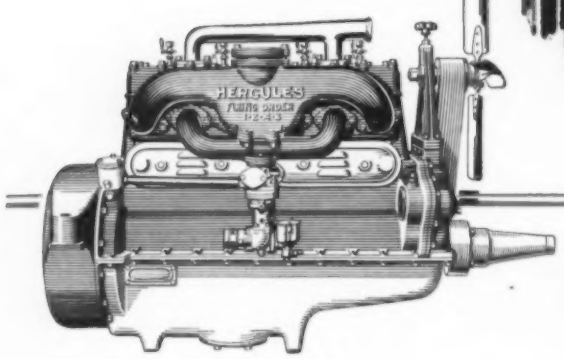




HERCULES ENGINES

Vol. XX No. 4 CONTRACTORS AND ENGINEERS MONTHLY, APRIL, 1930 Price, 25 Cents; $1 a Year
Entered as second-class matter, April 16, 1923, at the Post Office at New York, N. Y., under Act of March 3, 1879. Issued Monthly by The Buttenheim-Dix Publishing Corp., 443 Fourth Ave., New York. Printed in U. S. A.

Foundations

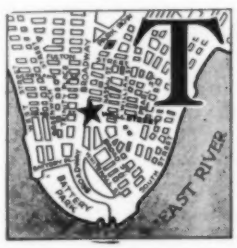
for The Irving Trust Company Building

By

Max H. Foley

Voorhees, Gmelin & Walker

New York



THE Irving Trust Co. building is being erected at One Wall Street on the southeast corner of Broadway. The plot occupies the block front on the south side of Wall Street between Broadway and New Street and extends 179 feet south on both of these thoroughfares. The building will house the headquarters activities, banking rooms and vaults of the Irving Trust Co., and will have numerous floors of rented office space. As the world's tallest building constructed entirely of limestone, it is to fulfill the purpose of its owners not only to provide

General View of the Lot While the Caissons Were Being Sunk

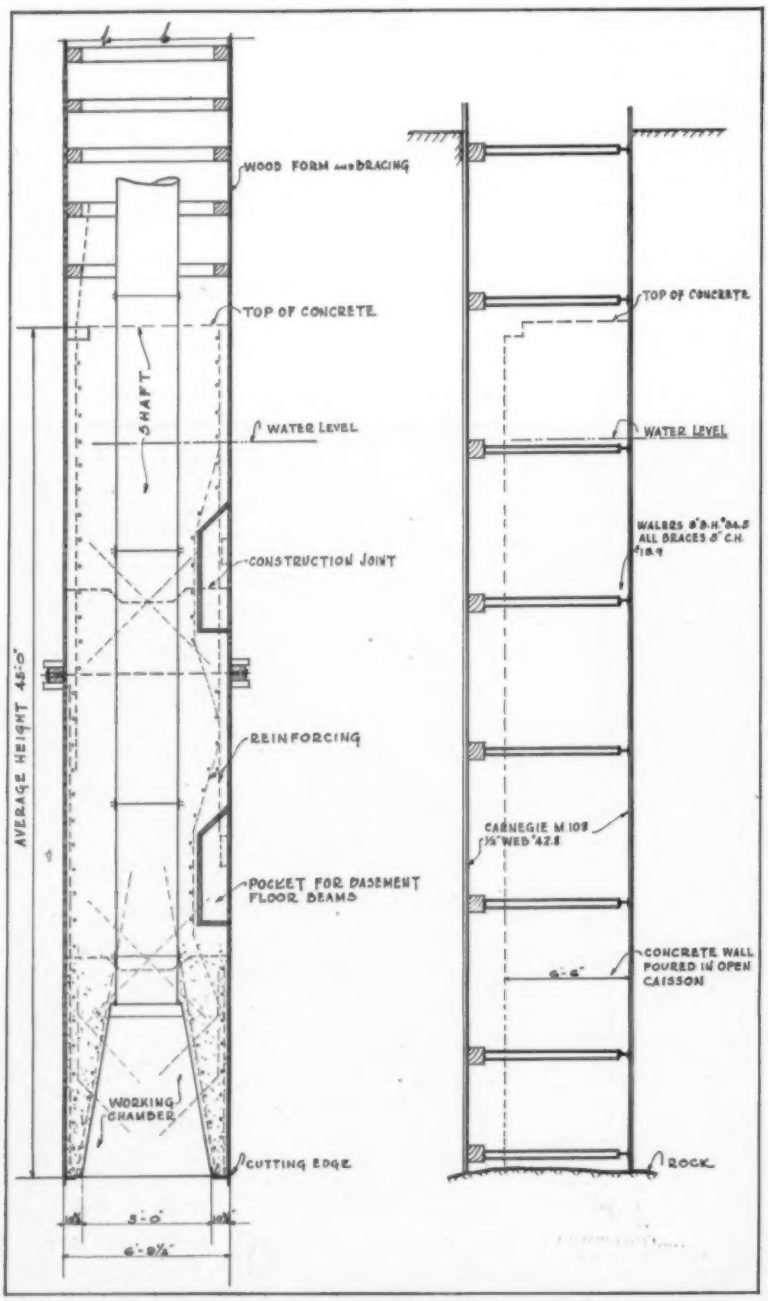
headquarters for one of the country's financial institutions, but also to erect a fitting monument at the gateway of the business center of the world.

FOUNDATION PROBLEM

The foundation problem included underpinning the north wall of the 22-story building at the south side of the lot, taking care of the Broadway subway structure which runs along the westerly lot line, and preventing loss of ground which would undermine old Trinity Church across Broadway and the old buildings on the north side of Wall St. Core borings were taken at eight different points in the lot and showed sand and quicksand down to a thin layer of hardpan which was immediately above the rock. The water level is 28 feet below Broadway. Rock elevation varied from 40 feet to 65 feet below Broadway.

TYPES OF CAISSONS USED

After considering both the pneumatic caisson and the open caisson methods for constructing a cofferdam wall along the three street fronts, it was decided to use pneumatic caissons for all of the wall except two sections adjoining the Central Union Trust Building, one on Broadway and one on New Street. The pneumatic method was employed to insure against loss of ground for the greater part of the perimeter. The open caissons at the south end were necessitated by having to remove cylindrical concrete caisson piers, 9 feet in diameter, which rested on rock and were the foundation of the Century Building. Two of these piers came in the line of the Broadway wall and two in the New Street wall.



FIGURES 1 AND 2. SECTIONS THROUGH PNEUMATIC AND OPEN CAISSONS

Left, pneumatic caisson. Right, open caisson

DEMOLITION AND FOUNDATION FOLLOW CLOSELY

Demolition of the four existing buildings was started May 1, 1929, and completed at the end of June. The underpinning of the wall of the building at the south had been completed prior to the start of demolition, working from the inside of the building itself.

Foundation work was started July 22, and was substantially complete by December 15. Steel sheet piling was first driven on the three street fronts and held with spur braces. The sinking of alternate caissons for the cofferdam wall was then started on August 10, and the wall was completed on September 26, 1929. There were eleven pneumatic reinforced concrete caissons, 6 feet 6 inches thick and from 25 to 32 feet in length, and two open caissons 55 feet long.

PNEUMATIC CAISSONS

Fig. 1 shows a cross-section through a pneumatic caisson with working chamber and a single shaft for men and buckets. The mucking out with buckets was handled by eight derricks working from the corners of two towers. The caissons were sunk from a level 20 feet below Broadway and landed on rock at an average depth of 65 feet below the sidewalk, the last 37 feet being below the water level. The caissons reached satisfactory hard rock at elevations quite close to those which

had been predetermined. Pockets and reglets had been formed in the inner sides of the caisson units to receive floor beams and slabs for the basement floors. This provision made it necessary to set both a minimum and a maximum depth to which the caisson structures could be sunk. Where it was necessary to go deeper than the maximum to get hard rock, the caissons were underpinned underneath the cutting edges.

Fig. 2 shows a section through one of the open caissons at the south end of the lot. Steel sheet piling was driven to rock around these sections and the dirt mucked out in buckets. The old cylindrical caissons were blasted out as the digging went on. The water was kept down with steam pumps.

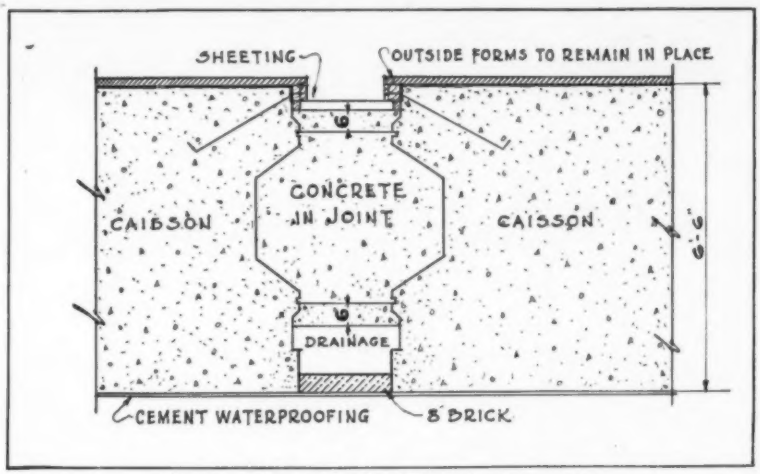
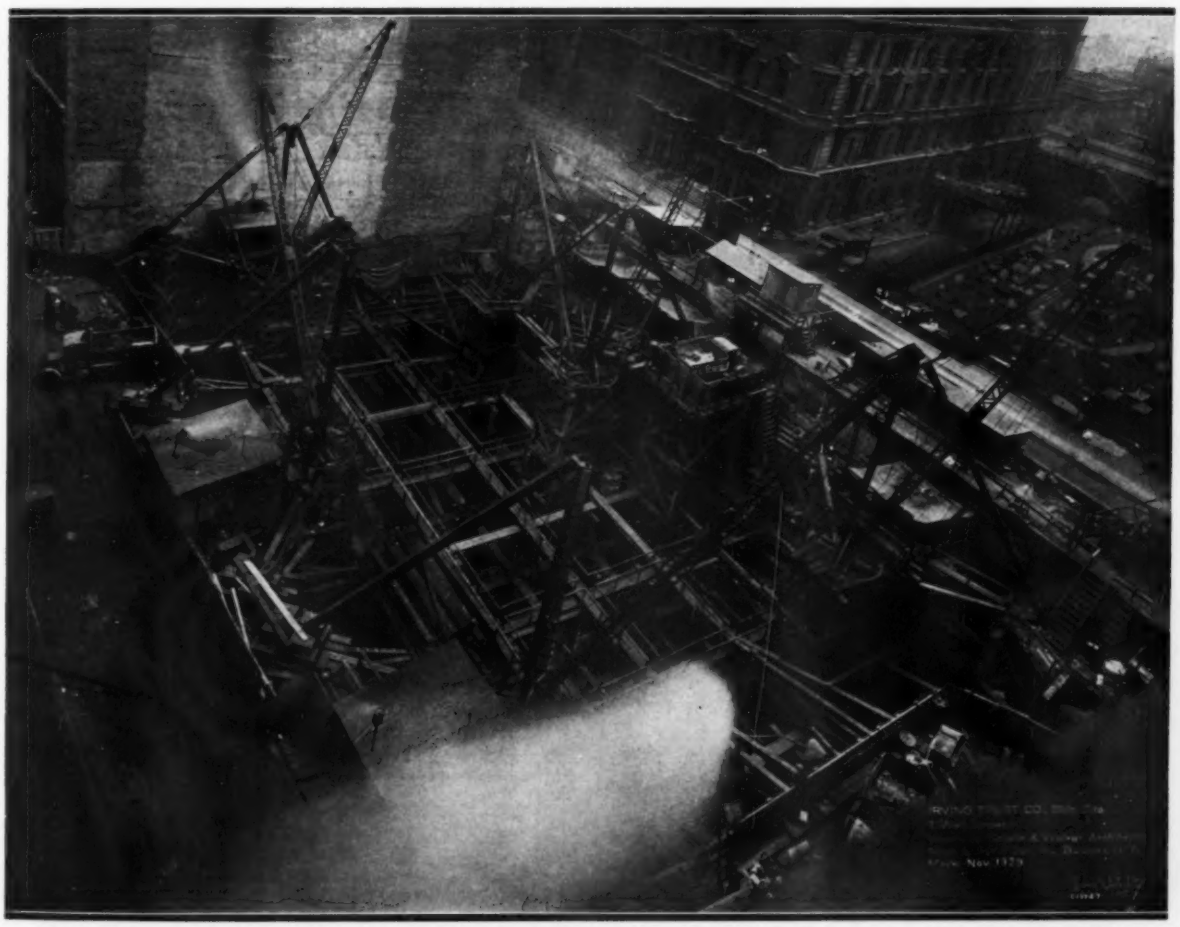


Figure 3, Showing Section Through Caisson Joint

CAISSON JOINTS AND BRACING

The joints between caissons were 3 feet 6 inches wide at the center and of the form shown in Fig. 3. When two adjacent caissons had been landed in place, steel sheeting was driven to rock to enclose the joint, the top was decked over, and the dirt removed by a man working under air. The two 6-inch concrete walls were first poured and then the inside of the joint was filled. The inner face of the joint was built up with 8 inches of brick, leaving a vertical space for seepage water to drop down into the drainage course under the bottom basement floor.

When the cofferdam wall had been completed, making



General View of the Lot Showing Cross-Lot Bracing After the Caisson Wall Was Completed and General Excavation Was in Progress

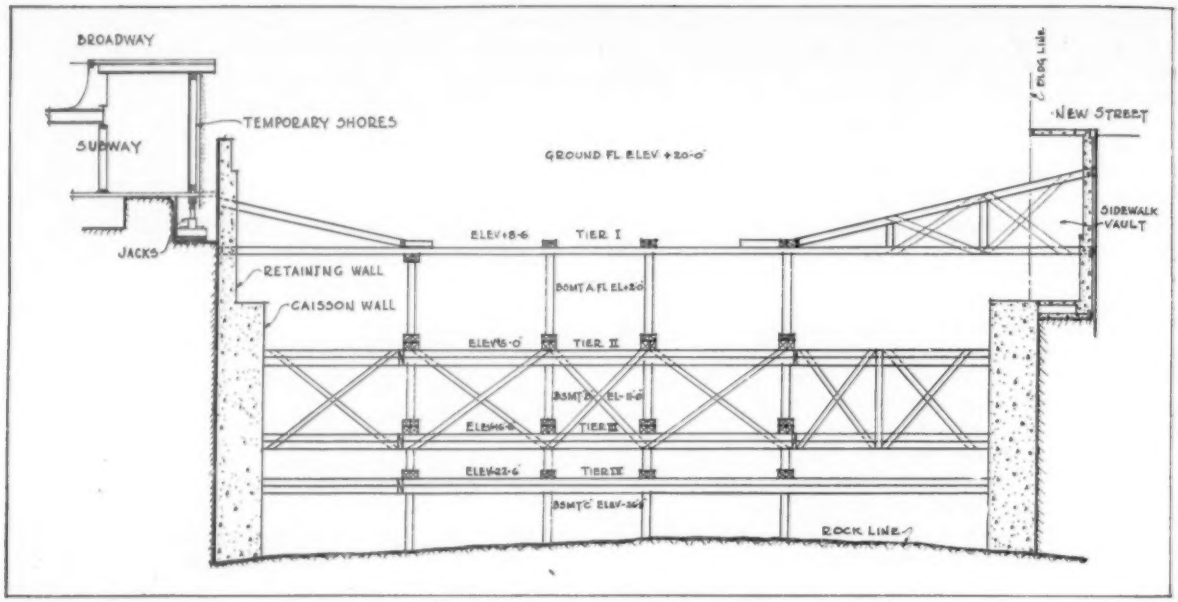


Figure 4, Section Through Lot Showing Cross-Lot Bracing

a seal against tide water, excavation in the lot was started. As the work proceeded successive tiers of cross-lot timber braces were constructed and wedged to hold the cofferdam walls as shown in Fig. 4. This bracing remains until the structural steel and stone concrete slabs in the basement floors are in place and ready to take the outside pressure. Excavation was carried down

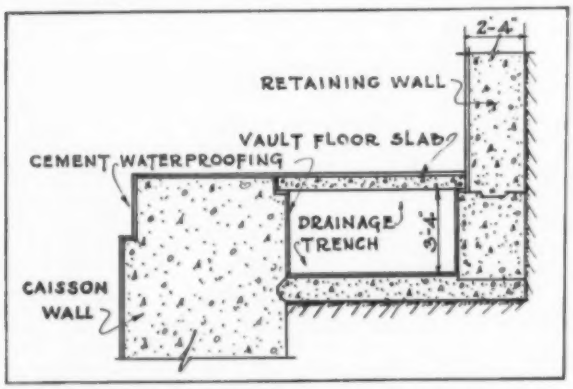


Figure 5, Section Through Trench Under Sidewalk Vault

to rock over the entire basement providing for five floors below the Broadway level.

DRAINAGE

The grillages for the exterior steel columns rest on the caisson wall and the interior grillages on the rock bottom. The lowest point of rock excavation for an interior pier is 89 feet below Broadway. Reinforced concrete retaining walls were built from the top of the caisson wall to grade. These walls are along the building line on Broadway but are outside the lines on Wall and New Streets, forming a sidewalk vault. In connection with the sidewalk vault, the precaution was taken to construct a concrete trench about 5 feet deep under the vault floor. This was done as shown on Fig. 5, to provide drainage for water which might find its way through future cracks between the sidewalk vault structure and the cofferdam wall and do damage inside the building. Water entering the trench will be drained down through two of the caisson joints to the underfloor drainage system.

After tide water had been sealed out by the cofferdam wall, very little water was encountered in excavating the lot. There is no assurance, however, that a considerable amount of water may not come up through the rock seams later, and a complete underfloor drainage system is installed under the lowest basement floor. Fig. 6 shows a section through the filter bed and drainage course construction through which the water finds its way to a 11,760 gallon sump pit. From the sump pit automatic pumps will pump it up into the sewer.

Cement waterproofing, 1 inch thick, was applied over the entire basement floor slab and up the inside of the cofferdam and retaining walls. The waterproofing is carried under and around all exterior and interior grillages and over the floors and walls of pits and trenches.

PERSONNEL

The architects for this building are Voorhees, Gmelin and Walker. The consulting engineers for the foundation are Moran & Proctor. Marc Eidlitz & Son are the general contractors and the sub-contractors for the foundations are the Foundation Co.

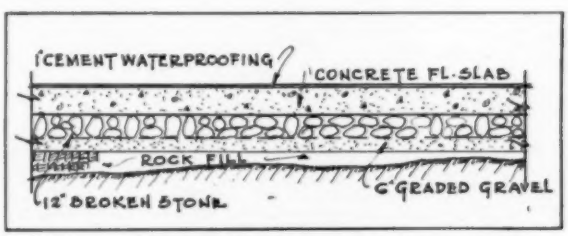


Figure 6, Section Through Drainage Course Under Basement Floor

"Unclassified Excavation"

Utopia *and* Hades

By Harry R. Hayes, C. E.

Engineering Secretary

New York State Highway Chapter

A. G. C. of A.

Unclassified Excavation Appears in the Specifications of Many States— It Is a Necessary Evil But Must Not Be Used as a Subterfuge by Engineers

IT is not the intention of this article to raise an objection to the principle of unclassified excavation. It is properly an item of a specification for engineering construction. As such an item, however, in a general specification for diverse kinds of public construction work it cannot be considered as having universal application to all contracts awarded under such a specification. If this were true, it would be inconsistent to include in such a specification items of earth, rock, and other classes of excavation. Classified and unclassified excavation are appropriate items but their inclusion in a contract must be supported by sound engineering conclusions for each must have its own peculiar application.

A Contract Is a Divided Responsibility

In the prosecution of a public work contract, the division of responsibility as between the engineer and contractor should be clearly understood. Appropriating the prerogatives of the other should not be attempted by either of the parties to the contract and the obligations of both agreeably assumed and definitely discharged. If such an equilibrium of contact is not maintained, misunderstandings appear and controversies ensue. It, therefore, follows that the engineer and the contractor should undertake the service each is to render with a view of producing the greatest harmony of effort.

The element of risk and uncertainty accompanying the actual construction operations cannot be estimated but they are entirely the burden of the contractor. These he should naturally expect to meet on his own responsibility. To add to them by the failure to provide clear, definite, and complete plans and specifications is not only unfair but such neglect is accountable for other risks which should properly be placed upon the shoulders of the engineer.

Time Element Important

The time permitted for a contractor to study the plans for a public improvement is fixed by the engineer in the advertisement for proposals. The time necessary for the engineer to give to it is also fixed by himself and can be as long as he deems necessary. He therefore has no excuse for incomplete drawings and specifications. The engineer has all the time he desires to study the proposed construction but the contractor has relatively little time to become familiar with the details and to determine completely their effect upon costs and other features of construction operations.

Vague or incomplete plans and specifications are not the foundation for intelligent bidding but, when sufficiently comprehensive, indicate the competency of the engineer.

New York State Specifications as an Example

There are one hundred and four items in the specifications of the Division of Highways of the New York State Department of Public Works. As all contracts are awarded on an itemized unit price basis, the contractor is right in expecting to have each item clearly explained and the work thoroughly described in accordance with the data in possession of the engineer affecting all items in each particular contract. If there is any one item in most New York State highway contracts which is not susceptible of definite analysis within the means and time allowed to a prospective bidder it is the one of excavation. This fact emphasizes the duty of the engineer to present it with the utmost clarity.

On road construction in some parts of the State, the hazards encountered in the excavation work are not

especially troublesome but for the greater part of the contracts annually awarded, the character of the material can only be surmised and the proportionate amounts of loam and rock left to the imagination of the bidder for determination. To lump all such excavation under the general heading of unclassified is contrary to sound engineering practice.

DATA FROM THE COURTS

The Courts have recognized the duty of the State to furnish complete and adequate information to prospective bidders and to undertake the execution of contracts for public work in fairness to all parties.

In Harvey vs. Duffy (1917) 101 Misc. 641; 168 N. Y. S. 814, the Court ruled in defining a provision of the Highway Law as follows:

"The clear purpose of this provision is that the engineer's estimate shall furnish information to, and serve as a guide for, a proposed bidder as to the quantity of the work of various kinds to be done and with respect to the materials to be furnished."

Unclassified excavation as an item in the majority of the highway contracts is contrary to the Court's interpretation of the law specifying how such contracts should be drawn.

In Atlantic Constructing Co. vs. State (1918) 103 Misc. 233; 175 N. Y. S. 453, the Court said:

"It is the duty of the State in entering into contracts with its citizens to set a standard which for fairness, justice, equity, honesty, and plain frank statement of its purpose, without subterfuge or circumlocution, shall be beyond all criticism as being in any way possible of deception."

MAKING IT EASY FOR THE ENGINEER

Unclassified excavation on contracts where the conditions do not warrant it must be considered a subterfuge. The only reason that the writer has ever heard advanced for its adoption was to eliminate controversy as to the character of the classified material encountered and also to reduce to a minimum the cases which could be brought to the Board of Claims for adjustment and settlement.

Such an admission if it were made could carry nothing but an implication of the inability of the engineer to interpret his own specification and the lack of confidence in his own capacity to demonstrate the wisdom of his judgment if subjected to review.

FAIR SPECIFICATIONS BRING BETTER BIDS

Excavation operations on road construction constitute at least 25 per cent of the entire work. This ratio is considerably higher on a very large number of road contracts in this State with the correspondingly greater difficulties in planning and planting the job. When the type of excavation is reasonably indicated and estimated, it invites fairer competition, for all bidders are given the same information as to what may be encountered and eliminates the risks involved in unclassified excavation when such essential information is withheld by the Engineer.

The plans submitted for proposals on highway construction only indicate in a general way the line of the proposed work. Prospective bidders when examining the location often find it difficult to determine the alignment to follow. This is particularly true where new rights of way are involved. Very often after the work has started, changes are made in both alignment and grade and the original conclusions of the successful bidder are seriously affected. He must absorb all additional expense involved in such changes under the system of unclassified excavation.

A contractor is entitled to the same consideration which would be given to a departmental organization which if it undertook the work would charge the additional costs of unusual situations against the State where it belongs. The State of New York does not want any of its citizens to donate these roads but expects to pay a reasonable cost based upon a fair and equitable contract. Incomplete engineering services and errors of engineering judgment and their consequent cost in money and delay are items which should not be transferred to the shoulders of the contractor.

DON'T BE ARBITRARY!

Most everyone familiar with highway construction in the State of New York is very definitely of the opinion that each class of excavation should be included in a general specification for such work and separately applied where the conditions warrant. A general policy of unclassified excavation is radically wrong in principle and decidedly contrary to general engineering practice. The responsibility of inferior quality of construction service is very often due to an arbitrary departmental policy.

ACKNOWLEDGMENT.—From *The Low Bidder* published by the New York State Highway Chapter, A. G. C. of A.

$1,601,167,455 to Be Spent by States and Municipalities for Highways in 1930

FORTY-FIVE of the 48 states, together with the local authorities, are going to spend $250,000,000 more on their road building programs during 1930 than they did in 1929. The planned expenditure by state highway departments for construction and maintenance of state highways is $937,500,455, the balance, $663,667,000, is to be spent on local roads and bridges.

The state highway officials of 45 states estimate the total length of roads to be improved by them in 1930 as 32,532 miles, an increase of 3,126 miles over the estimate in the 1929 program. The states of greatest population and industrialization in which unemployment is naturally greatest, showed the highest contemplated expenditures. The Middle Atlantic States, comprising New York, New Jersey and Pennsylvania, plan to spend $374,835,310 on improvement of state and local roads. The East North Central States of Ohio, Indiana, Illinois, Michigan and Wisconsin plan to spend $303,696,000.

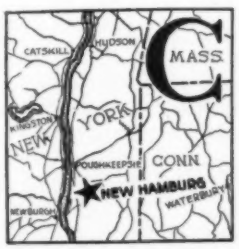
The West North Central States, including Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas rank third in their contemplated expenditure of $236,461,727, and the South Atlantic States of Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia and Florida, with an expenditure of $182,872,418 rank fourth; the West South Central States of Arkansas, Louisiana, Oklahoma and Texas rank fifth with an expenditure of $154,100,000; and the Pacific States comprising Washington, Oregon and California rank sixth with an expenditure of $121,590,000.

Kentucky, Tennessee, Alabama and Mississippi, making up the East South Central group, plan to spend $101,992,000 on state and local road improvement; Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut in the New England group plan to spend $75,430,000; and the Mountain States of Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah and Nevada, $50,190,000.

Building *a* Small Concrete Arch Bridge *in* Cold Weather

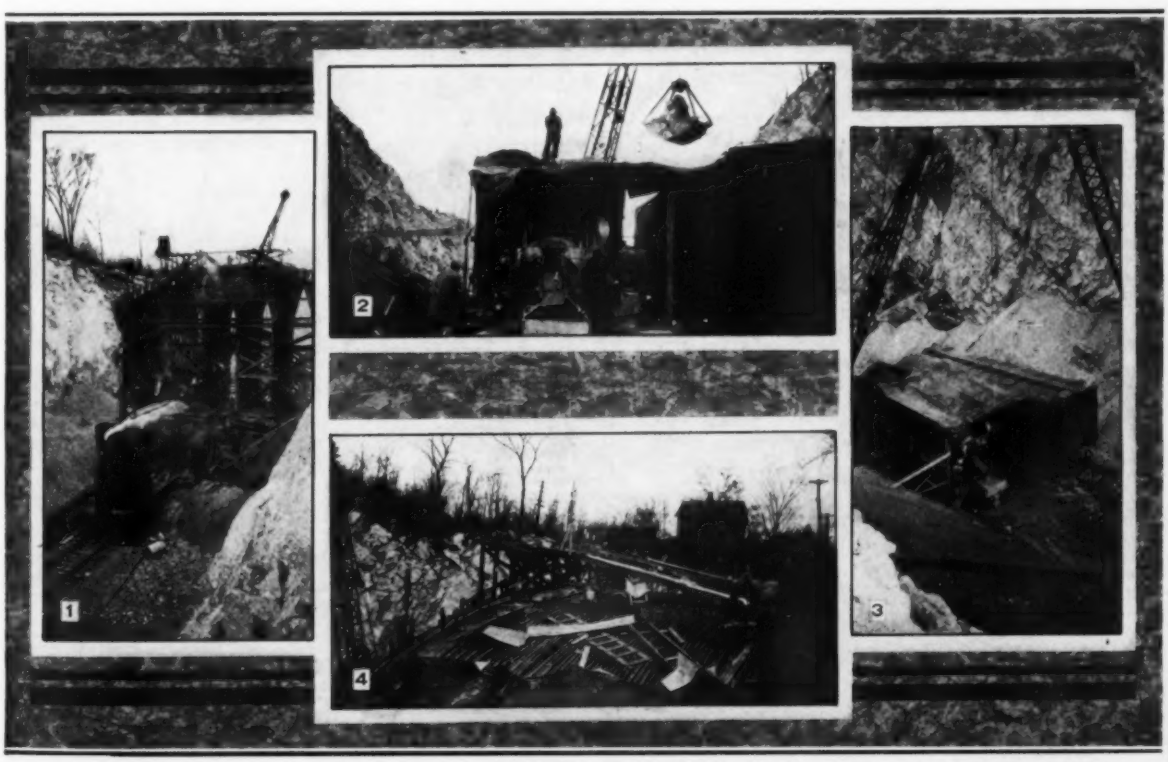
By
Ralph Sinsabaugh

Concrete Bridge Across New York Central Railroad Where Open Cut Replaces Tunnel



CONTINUATION of the four-track program of the New York Central Railroad on the east shore of the Hudson River called for a tunnel at New Hamburg, N. Y., just south of Poughkeepsie. The preparations for this work were described in the July, 1929, issue of CONTRACTORS AND ENGINEERS MONTHLY. After work had progressed for some distance, it was found that the rock had soft intrusions which caused slides. Consequently, the construction of the tunnel was abandoned and the work was continued in open cut. The excavation of the cut necessitated the construction of a bridge to carry traffic at one point and a reinforced concrete arch bridge was designed.

As the work progressed, it became apparent that the bridge would be constructed in cold weather, so the Walsh-Kahl Construction Co., of Davenport, Iowa,



PLANT FOR HANDLING AGGREGATE, CEMENT AND CONCRETE ON THE NEW HAMBURG BRIDGE
1. General layout of plant and cranes in relation to bridge forms. The crane in the foreground loaded sand and crushed stone into the bins. 2. Aggregate crane in background with mixer and concrete bucket in foreground. 3. Same as 2 from the top of the cut. 4. Looking across the arch forms from the west side of the cut, showing reinforcing, platform and sectional chutes for concrete

made the necessary preparations for protecting the cement and heating the water and aggregate.

PREPARATION OF FORMS

The wooden forms for the bridge were built, making a perfect arch over the four-track cut. Reinforcing bars were spaced about 6 inches center to center throughout the arch except near the haunches, where they were placed as close as possible and yet with sufficient space to permit the concrete to flow readily between them. They were 1 inch in diameter and 30 feet long. The average thickness of the arch is about 5 feet.

MATERIAL HANDLING

Two of the four tracks through the cut were laid temporarily to accommodate the locomotive cranes and a car of cement. The bracing of the forms was so arranged that Crane No. 2 and the cement car could be removed. The accompanying diagram shows the general layout of the material-handling plant.

Five carloads of Knickerbocker Lone Star cement were spotted so that they could be run up into the cut, and sufficient sand and crushed stone were stock piled at either side of the cut to take care of the pour of 700 cubic yards of concrete. All the materials were heated for 48 hours before using by steam pipes beneath the stock piles. Steam was kept up in the pipes until the pouring was completed, and the water pumped from the Hudson River was also heated before reaching the mixer.

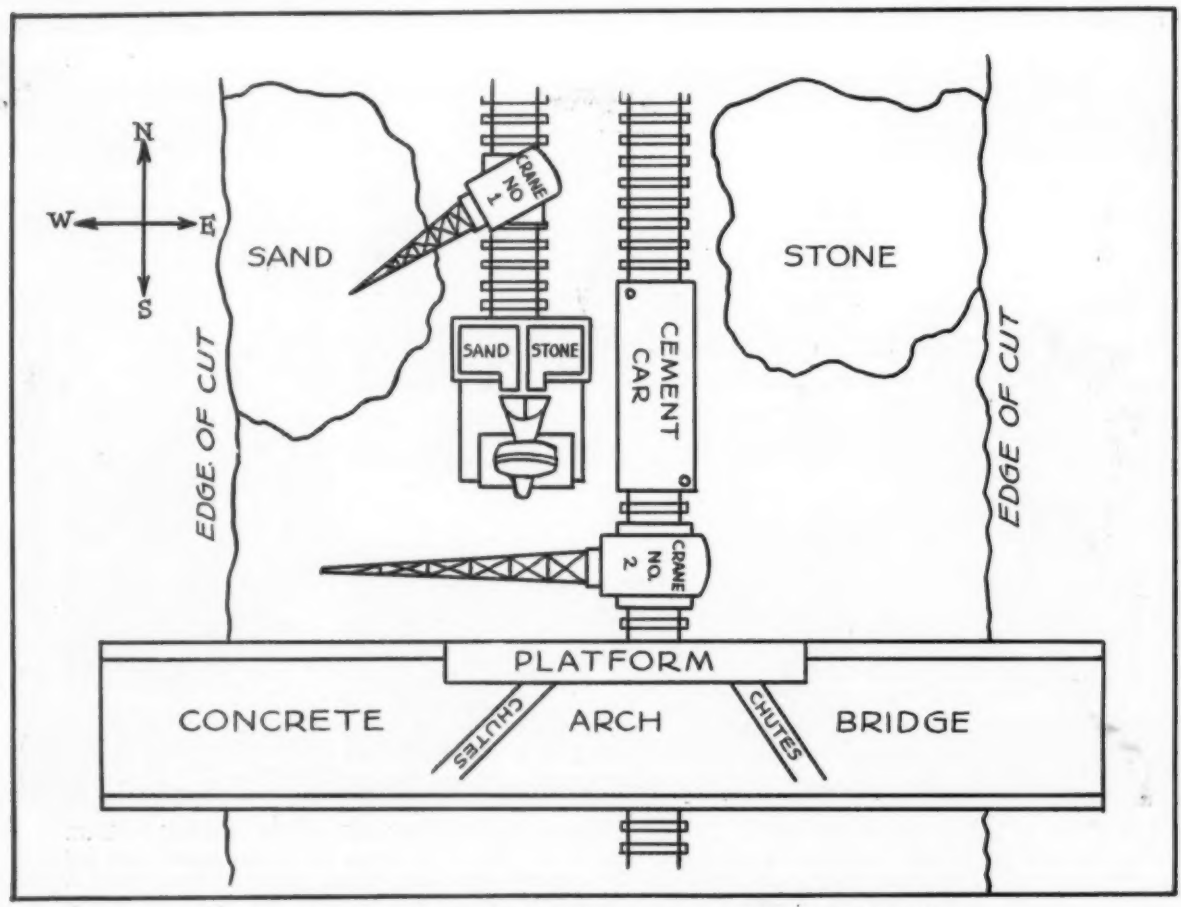
A Jaeger 14-S non-tilting mixer, with a divided skip for properly proportioning the sand and rock was mounted on a platform with the aggregate bins immediately above it. Three bags of cement were taken directly from the cement car and dumped into the skip for each batch to make the 1 : 2 : 4 mix.

A Browning locomotive crane with a 50-foot boom was used to load sand and stone from the stock piles into the storage bins. The crane was equipped with an Owen ¾-yard clamshell bucket. A Browning No. 8 locomotive crane with a 75-foot boom was used to handle a 1-yard Insley concrete car bucket from beneath the mixer chute to the platform built on top of the bridge forms, from which the concrete was chuted as desired to various sections. Two batches from the mixer were required to fill the concrete car.

TIME SCHEDULES

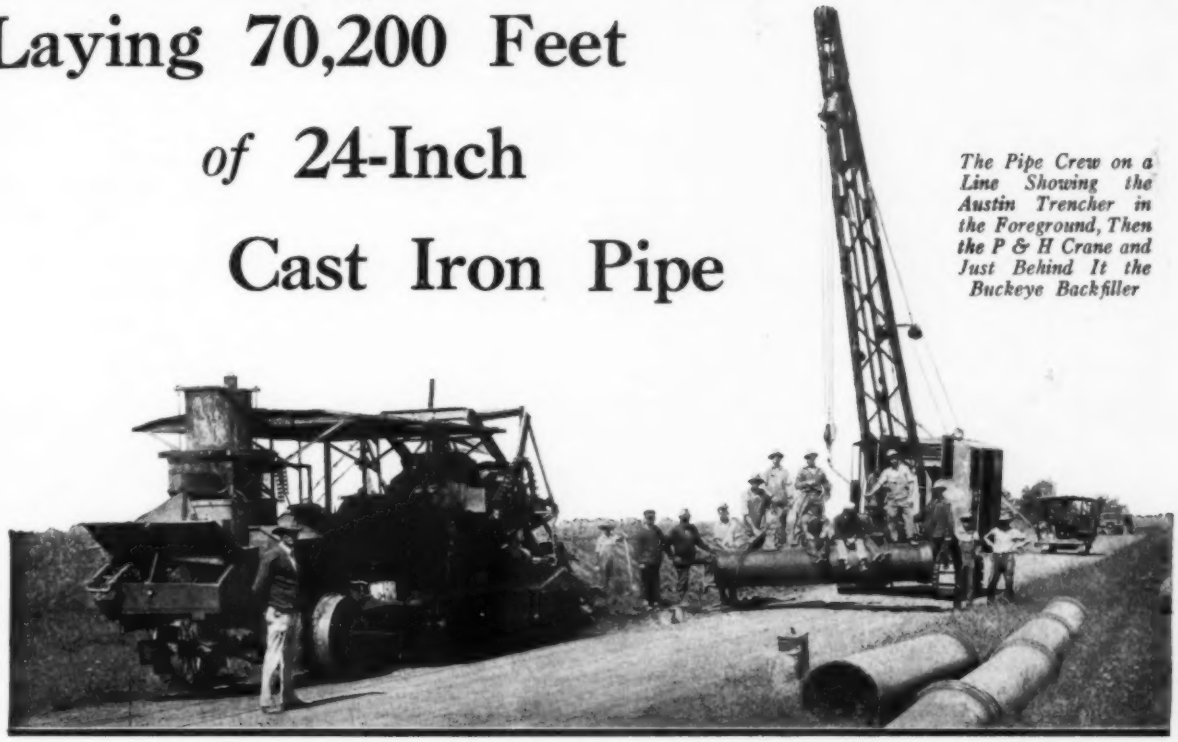
The first concrete pouring started on Friday, March 7, at 7 A. M., and continued steadily until 11 A. M. on Saturday. This took care of the concrete at the haunches. The weather was damp and foggy with plenty of rain, but the forms were well protected with tarpaulins, so that the concrete was not damaged. During the first pour about 420 cubic yards of mix was placed, it being evenly distributed at each end of the arch from the rock foundation for a distance of about 20 feet. This was kept under steam until the next day.

(*Continued on page 74*)



Plant Layout for Concreting Operations at the New Hamburg Arch Bridge

Laying 70,200 Feet of 24-Inch Cast Iron Pipe



The Pipe Crew on a Line Showing the Austin Trencher in the Foreground, Then the P & H Crane and Just Behind It the Buckeye Backfiller

By

J. J. Woltmann

Taylor & Woltmann, Civil Engineers

Bloomington, Ill.

THE new Money Creek plant of the Bloomington Water Co., which will furnish water for the city of Bloomington, Ill., is located about 14 miles northeast of the city. The filtration and pumping plant is located near the dam and the filtered and softened water is pumped through a 24-inch cast iron pipe line 70,200 feet long into the existing reservoir at the city. From this reservoir the city pumps the water into its distributing system.

About 45,000 feet of this line is pressure line and the remainder gravity. The summit is 80 feet above the elevation of the high lift pumps and 40 feet above the city reservoir. High tensile strength cast iron pipe was used for the line and was furnished by the United States Pipe & Foundry Co. Of the total length of pipe, 800 feet was for 300-foot head, 24,400 feet for 200-foot head and 45,000 feet for 100-foot head. The joints were made with Leadite, using ⅝-inch square braided jute for packing.

About 75 per cent of the line was laid in public highways, the remainder along a private right of way through farm lands. That part of the line within the limits of the town of Normal was laid along the right of way of an improved open creek channel. The average depth of trench excavation was 6 feet. In crossing under the tracks of the Chicago & Alton and the Illinois Central Railroads, lines of 54-inch corrugated culvert pipe were first jacked through the embankment and then the cast iron lines laid in the culvert pipe. Manholes were placed at one end of the line under the railroads to permit inspection of the lines at any time.

Gate valves were placed about one mile apart. Air

Laying a Length of the 42-Inch Cast Iron Pipe with a Sling and Hook

Pouring a Leadite Joint—Note the Well Tamped Backfill and the Alignment of the Pipe

valves were placed at important summits and blow-offs at many of the low points.

HANDLING PIPE

The pipe was unloaded from cars with a truck crane onto motor trucks and hauled to the line. The trucks hauled two or three 12-foot lengths at each load, the average haul being about 3 miles.

For digging the trench and handling the pipes the contractor used one Austin trenching machine, one P & H Model 300 crane and a model D Buckeye backfiller. The crane followed closely behind the trenching machine, picking up the pipe from the side of the road where it had been deposited by the trucks and placing it in the trench. The backfilling followed as closely as possible after the pouring of the joints.

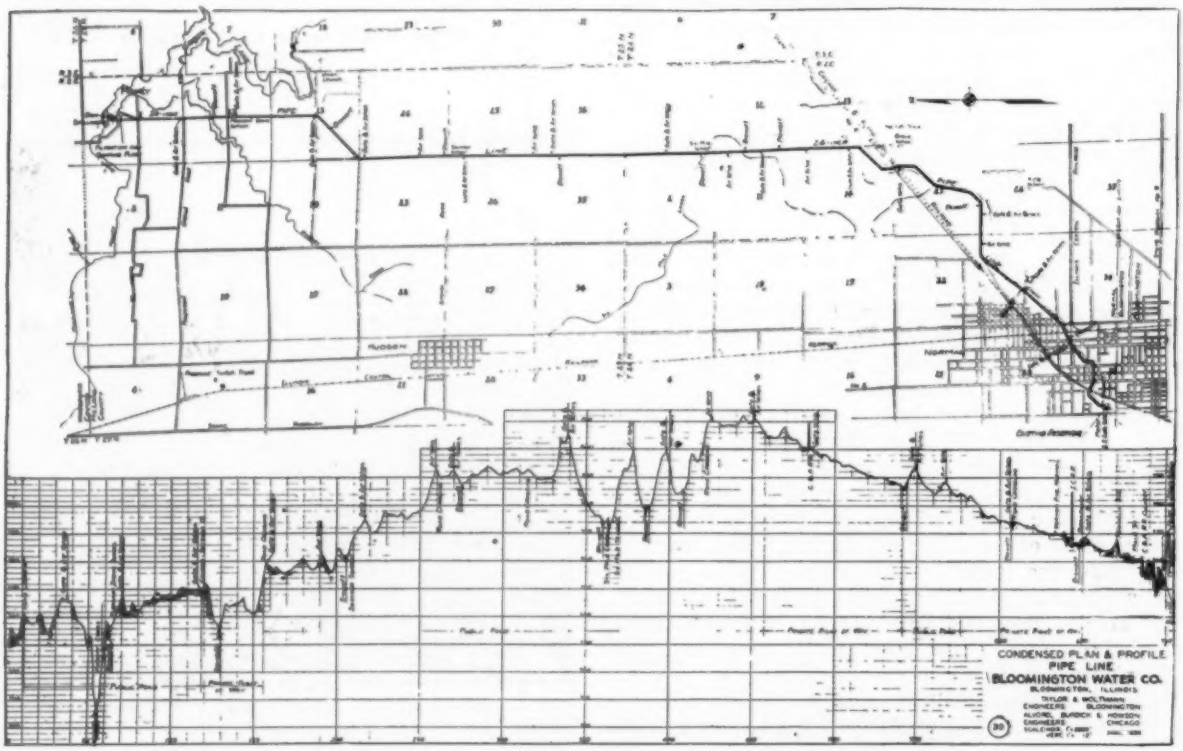
The work was started on June 18, 1929, and the pipe laying was completed on December 18, 1929. The average progress per working day was about 500 feet, and the largest day's run was 91 lengths, or 1,092 feet. The above time does not include the time taken for testing the line and cleaning up after backfilling. This has been slow work because of the winter weather.

The specifications called for a joint leakage of not more than 150 gallons per mile per day per inch diameter of pipe or 3,600 gallons per mile per 24 hours. The test pressures varied from 22 to 103 pounds. The line was filled with water under pressure of 40 to 50 pounds for about 6 weeks and it seems that the conditions of the specifications will be met satisfactorily. At the beginning of the test the leakage very greatly exceeded the allowable leakage.

PERSONNEL

The contract for the pipe laying was awarded to the Merkle Contracting Co., Kansas City, Mo., for whom I. V. Greene was Superintendent. The hauling of pipe was sublet to Fransen Bros. of Chicago and the jacking of the corrugated pipe under the railroad tracks to the W. Q. O'Neill Co. Engineers for the Bloomington Water Co. were Taylor & Woltmann, Bloomington, Ill., and Alvord, Burdick & Howson, Chicago, Ill., with W. A. Peterson as Resident Engineer.

The construction of a scenic roadway through the Arroyo Seco, California, where at one point it passes through a saddle and hangs on the precipitous walls about 600 feet above the floor of the canyon will be described in the May issue of CONTRACTORS AND ENGINEERS MONTHLY



A Comparison

Between

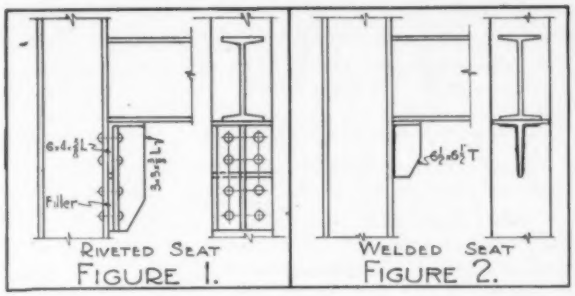


FIGURE 1. FIGURE 2.

Riveted *and* Arc Welded Structural Design

By
C. M. Taylor
Vice President, The Lincoln Electric Co.
Cleveland, Ohio

THE arc welded design of steel structures often presents a problem to designers because of the fact that it is a more or less new method and they feel that it is somewhat foreign to the traditional method of construction. This, however, is not the case. The fundamental principles which govern the design of arc welded structures are the same as those that govern riveted construction. Any one competent to design riveted work can make equally efficient arc welded designs. It is merely necessary to become "welding minded."

In designing riveted details ample space must be allowed for placing of rivets, and the angle is the prime member required. In arc welded construction very little space is required for welding, and the plate is the prime member required, due to the fact that with arc welding two members may be joined at right angles without the use of a connecting member as required in riveted construction. Thus fewer members or pieces are required in arc welded construction.

Another point to consider is that in riveted construction the number of rivets required in any given point is simply the stress to be resisted at that point divided by the value of one rivet. In arc welded construction the length of a fillet weld required is simply the stress to be resisted divided by the unit strength of the fillet weld. The fundamental difference between riveted and arc welded connections is that the arc welded connection is more direct than is possible to obtain in riveted construction. With the electric arc process the members joined are fused into each other, actually making the members into one piece of steel.

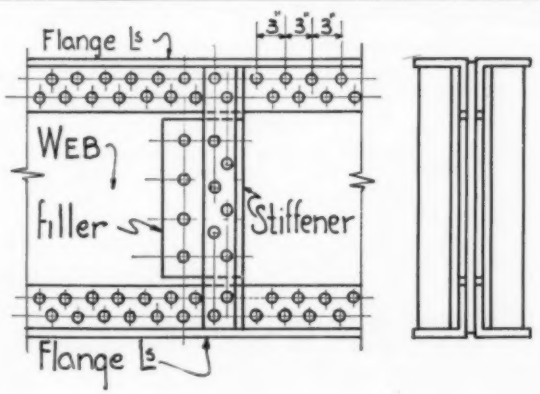


FIGURE 3.

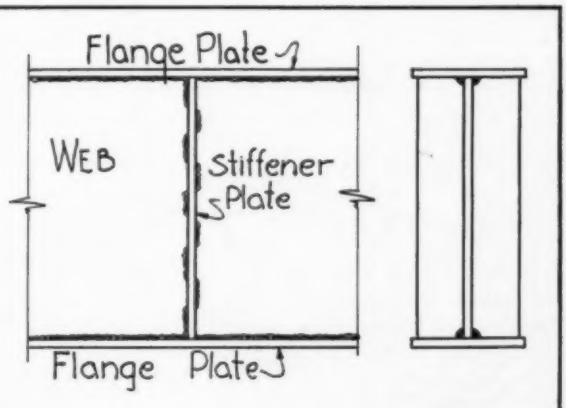


FIGURE 4.

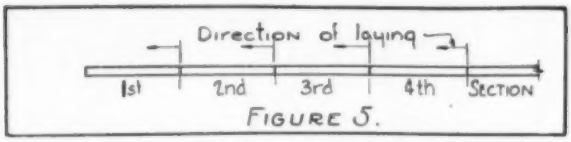


FIGURE 5.

A plate, an angle or a tee cannot be riveted by their edges but they are arc welded that way. This condition accounts for the difference between the layout of both main members and details in riveted construction compared with that possible in arc welded design.

A multitude of tests have already been made to determine the strength of arc welded joints of all kinds and as a result the values of fillet welds of various sizes are well established. The following practical and safe values are used for shear and for tension:

3/16-inch	Full Fillet	Weld.....	1,500	pounds per	linear inch
1/4-inch	Full Fillet	Weld.....	2,000	pounds per	linear inch
5/16-inch	Full Fillet	Weld.....	2,500	pounds per	linear inch
3/8-inch	Full Fillet	Weld.....	3,000	pounds per	linear inch
1/2-inch	Full Fillet	Weld.....	3,500	pounds per	linear inch

These values may be increased 20 per cent when the welds are used in compression instead of in shear or in tension.

BEAM SEATS

A graphic comparison of arc welded and riveted designs of structural details shows the extreme simplicity of modern design. A beam seat, as shown in Figures 1 and 2, serves as an excellent example of these details.

Figure 1 shows a riveted beam seat designed for a load of 45,000 pounds. It consists of a 6 x 4 x ⅜-inch seat angle, a ⅜-inch filler, a 3 x 3 x ⅜-inch stiffener angle, 12 inches long, and 8¾-inch rivets. Figure 2 shows the same connection arc welded. It consists of a piece of 6½ x 6½-inch T, 3 inches long, and 18 inches of ⅜-inch fillet weld.

In these details the saving in weight and number of pieces used are clearly shown. In forming the riveted seat 11 separate units had to be used: two angles, one plate and 8 rivets. The same seat arc welded is composed of only one piece, a 6½ x 6½-inch T.

The savings in weight and material, however, are not the only economies effected by arc welded designs. To fabricate a beam seat as shown in Figure 1 requires a considerable amount of laying out; punching a total of 20 holes in 4 pieces which comprise the beam seat and the driving of 8 rivets to fabricate these members. In fabricating a beam seat as shown in Figure 2 there are only two pieces to handle. By joining the beam seat to the column by the electric arc process all punching and riveting are eliminated and the amount of laying out is materially reduced. There being only half as many pieces to handle in this modern design and half as many operations to perform in fabricating, it can be readily understood that a saving in time and labor is effected.

PLATE GIRDERS

Figures 3 and 4 illustrate a comparison of riveted and arc welded construction of a plate girder. Figure 3 illustrates the construction of a typical riveted plate girder, showing the web plate, flange angles, a pair of stiffeners and the required fillers. Figure 4 shows the design of a similar girder for arc welding. It consists of a web plate, flange plates and two stiffener plates. Assuming the rivet pitch to be 3 inches on each gage line, and that ¾-inch rivets are used, it follows that the riveted connection of angles to web plate has a strength of 6,000 pounds per linear inch. This corresponds to two lines of ⅜-inch fillet welds, one on each side of the web as shown in Figure 4. The stiffeners are connected by six rivets having a total value of about 60,000 pounds. The rivets correspond then to 20 inches of ⅜-inch fillet weld which appear in Figure 4 as a number of tack welds. If the stiffeners are intended to fit tight against the flanges, the ends of the stiffeners are arc welded to the flange plates.

The riveted design in Figure 3 calls for 9 members, all of which must be accurately laid out, punched and then riveted. The arc welded design, Figure 4, requires only 5 pieces. The fabrication requires considerably less laying out than the riveted design, and no punching and driving of rivets. The welding required by the modern design consumes only the time of one man as

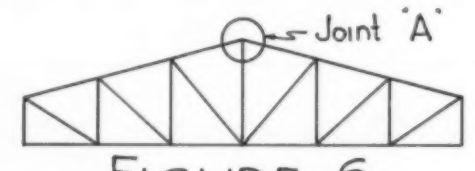
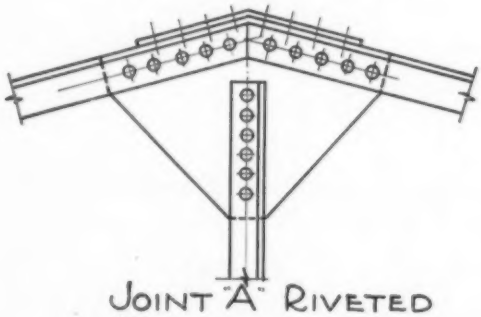
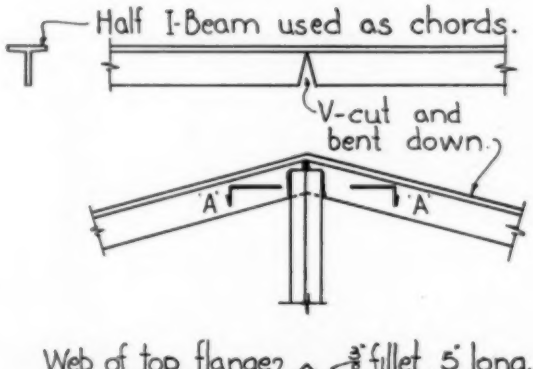


FIGURE 6.


JOINT "A" RIVETED
FIGURE 7.



SECTION A-A
JOINT 'A' WELDED.
FIGURE 8.

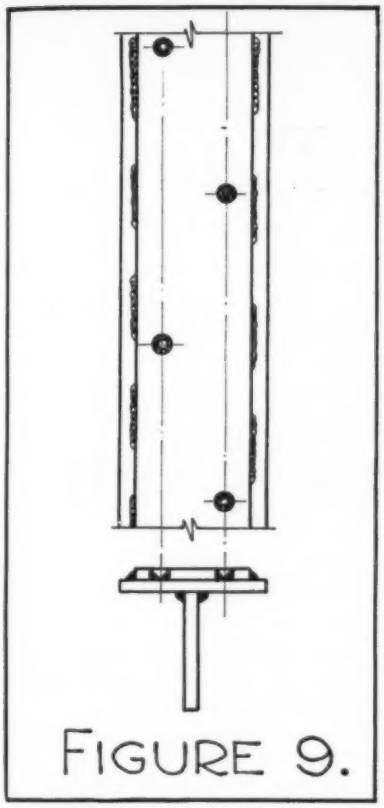


FIGURE 9.

compared to the 3 or 4 men necessary in riveting operations. Thus the arc welded design effects not only a saving in weight and material but reduces time and labor as well.

In making the fillet welds connecting the web to the flanges it is desirable to lay a short section of fillet at a time, the second section coming back to meet the first, as shown in Figure 5, and to alternate from one side of the girder to the other to avoid warping the plates. This is what is termed the "step back" method of welding.

TRUSS DETAILS

Still another illustration of the savings effected by arc welded construction may be seen in Figures 6, 7 and 8. Figure 6 is a truss for which a standard riveted detail of joint A is shown in Figure 7. The gusset plate serves to splice the vertical leg of the chord angles while the top plate splices the outstanding legs. The vertical is attached to the gusset.

Figure 8 shows the same joint for an arc welded truss. The chords are made by splitting an I-beam down the center, forming large T's. At the apex of the truss, the flange of the T is cut V-shape and is welded back again after bending. A continuous member is thus obtained. The web member is formed of two angles assembled box fashion opposite each other as shown in section AA. The six rivets connecting the web member have a value of about 60,000 pounds, requiring 20 linear inches of ⅜-inch fillet weld, or a 5-inch fillet weld at the edges of the angles as shown.

ELECTRIC RIVETS

Sometimes it is necessary to weld a member to another one directly through one of the two members. For instance, the top flange of a plate girder, Figure 9, may be so wide that a cover plate welded only along the edges would permit buckling. Occasionally it is necessary to strengthen a member without being able to reach the edges where fillet welds would normally be placed. In such cases holes are punched in the outer member and a fillet weld of suitable size is laid all around the hole forming what is termed an "electric rivet." The strength of an electric rivet is the unit strength of the fillet weld used multiplied by the perimeter of the center of the fillet.

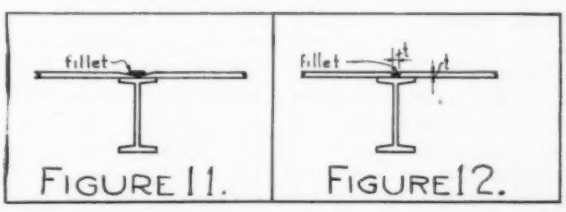


FIGURE 11. FIGURE 12.

PLATE FLOOR CONSTRUCTION

Figure 10 shows in plan and section floor plates to be welded continuously to supporting beams, so as, for instance, to form the floor of a swimming pool. The welding of each joint should not be executed continuously because of possible warping of the plates out of shape. It is desirable to lay down a fillet weld about 12 or 14 inches long in spot 1, then move over to spot 2 and put down a fillet weld there, then successively to spots 3, 4, 5, etc., coming back later and filling up the spaces left. This is called alternate welding. Obviously it is of advantage to use the largest plates possible to minimize the "footage" of welding. Cross joints do not require a steel member below, but may be arc welded over a strip of copper placed under the joint and removed after the welding is done.

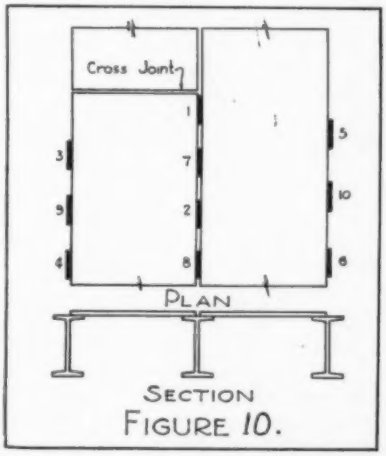


FIGURE 10.

In a case of this kind the strength of the weld is not as important as in the case of load carrying connections, but the work must be done carefully to prevent leaks. The edge of the plates may be left square, and a gap, at most equal to the thickness of the plates, left between them as shown in Figure 11, or else the plates may be bevel-edged and a small fillet weld used, as shown in Figure 12. It is purely a matter of relative economy.

The extensive use of the arc welding process in the fabrication of large structures and the redesign of machinery seems in itself to be adequate proof of the strength and rigidity available through this process. Arc welding fuses metal into metal, making the joints as strong as the members they connect, and allowing a saving in weight through the elimination of many gusset plates and connecting angles required in riveted construction.

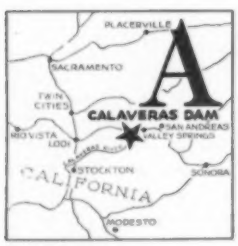
Through the study of arc welded construction designers are constantly discovering new and better ways of using this process. Many ways and means have been devised to reduce costs and time, and at the same time secure the most rigid and strongest possible construction.

Extensive Chuting Plant *on a* Large Dam

By

K. L. Parker

Superintendent, Bent Bros., Inc.
Valley Springs, Calif.



AFTER several disastrous floods the taxpayers of the City of Stockton, California, in 1925 voted bonds for the construction of a dam to control the flood water of the Calaveras River, a flashy stream in the foothills of the Sierra Nevadas, about 40 miles east of Stockton.

Unit Prices and Quantities

Land owner litigation held up the project until July 25, 1929, when a contract was awarded to Bent Brothers, Inc., contractors of Los Angeles, Calif., lowest of the bidders. This contract for $838,715.00 was based on the following unit prices and estimated quantities:

Foundation excavation, all classes, below elev. 530...	8,000 cu. yds.	@	$3.00
Cutoff trench excavation below elev. 530.....	200 cu. yds.	@	7.00
Foundation excavation, all classes, above elev. 530.	17,400 cu. yds.	@	2.80
Cutoff trench above elev. 530.....	1,000 cu. yds.	@	5.00
Cast concrete foundation drain, in place.....	2,800 lin. ft.	@	.50
Reinforcing steel furnished and placed.....	159,600 lbs.	@	.05
Cement.....	97,000 bbls.	@	2.68
Copper water seal furnished and placed.....	2,500 lin. ft.	@	4.00
Galvanized iron grout stop in place (City furnish material).....	5,600 lin. ft.	@	2.00
Structural steel furnished and placed.....	48,000 lbs.	@	.10
Slide gates, frames and operating equip. (City furnish material).....	105,000 lbs.	@	.02
Hand rail furnished and placed.....	2,705 lin. ft.	@	1.00
Placing pressure grout.....	500 fu. ft.	@	2.00
Drilling 2-inch grout holes, 20 feet deep.....	1,300 lin. ft.	@	3.50

On August 14, 1929, a new California law was enacted giving the State Engineer complete supervision of design and construction of all dams within the State. Although the original plans, contemplating the building of a gravity type dam arched in plan, had been approved by the State Engineer in 1925 and the contract let based on that design, at the instigation of Edward Hiatt, present State Engineer, the design was changed in the light of the latest engineering practice to a variable radius arch structure across the stream bed, with gravity section abutments and a long gravity arch wall at the north end. This change increased the quantities somewhat so that the dam, 1,500 feet long, 160 feet high above lowest bedrock, 50 feet thick at the base and 7 feet thick at the top, will contain approximately 125,000 cubic yards of concrete and require the removal of some 45,000 cubic yards of foundation excavation.

On February 1, 1930, approximately 75 per cent of the excavation had been completed and about 50 per cent of the concrete placed. The dam is scheduled to be completed early this summer and is already high enough to control effectively all but the most unusual floods.

The completed structure will provide storage for 163,000 acre feet of water and should very effectively protect Stockton from the flashy Calaveras River floods, which are of short duration. The minimum annual run-off recorded is 24,000 acre feet, the maximum being 750,000 acre feet. The average annual rainfall is 33 inches and the maximum flood on record 80,000 cubic feet per second.

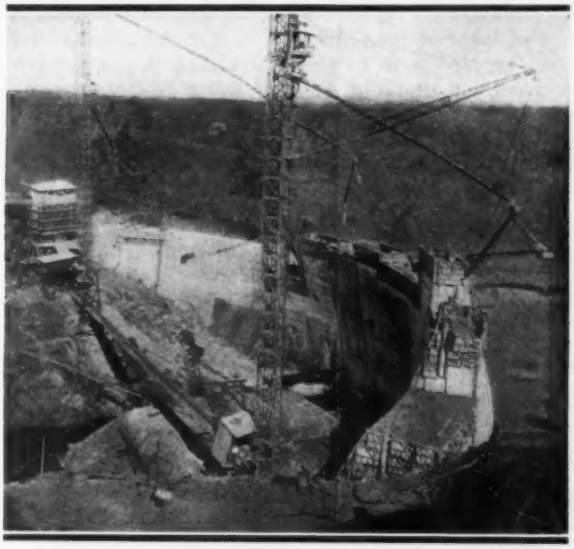
Control of Flood Waters

To control flood waters seven openings, each 5½ feet in diameter, are provided, entirely uncontrolled. Four openings, 4 feet in diameter plugged at the upper end, are to be constructed at a higher level, and a 36-inch steel sluice pipe is incorporated in the structure at streambed level, with a valve at the downstream end.

Design

The design of the arched streambed section of the dam is unique because of the decided overhang downstream in the center part of this arch, changing to just as much of an overhang upstream at each end of the arch. While variable radius arch dams are fast becoming more and more common, particularly in the West, this is believed to be the first of this type of structure in which the actual construction lines conform so closely to theoretical stress lines. In view of foundation conditions the variable radius arch has proved a great improvement over the original design. The legality of the contract, based on the original design was questioned and the work delayed greatly for about two months. A decision by the California ap-

Two Towers Connected by Belt Conveyor at the Calaveras Flood Control Dam



Looking North Across the Dam Showing the Two Insley Towers, the Conveyor and the Aggregate Bins with Mixers at the Extreme Left

pellate court cleared up the doubt and work has actively progressed since. That the change was made after construction had started and has progressed so well indicates fine cooperation between all parties concerned.

EXCAVATION

Excavation was handled by a 1¼-yard P & H gas shovel and a ¾-yard Erie steam shovel, both of which are convertible to cranes. The bulk of the excavation was first removed by shovel and 4-yard dump trucks. Later, the crane boom was installed and the remainder of the muck was hand-shoveled into skips which were hoisted out and dumped just beyond the limits of the dam. Overburden from the steep hillside on the south side was removed by sluicing, one 6-inch high-pressure pump of 800-foot head capacity being used.

HANDLING AGGREGATE AND CEMENT

Aggregates are obtained from gravel deposits ¾-mile below the dam site. They are dug with a 2½-yard Monighan walking dragline and are loaded on two trains, each having two 12-yard Western dump cars. The trains are pushed by 20-ton locomotives, operating on standard gage track, to a nearby gravel screening and washing plant. Here all aggregates are washed and screened in a Bodinson gravel plant, with a normal capacity of 1,200 tons per 8-hour shift. Aggregates are hauled from the washing plant to the dam in 4-yard dump trucks. The trucks are run over a trestle 450 feet long, 60 feet high, with a roadway 24 feet wide, and are dumped directly into bins over the mixing plant.

Rock and sand are measured by volume in Blaw-Knox batchers hung beneath the bins, and are then dropped onto two 30-inch conveyor belts running longitudinally beneath the bins. Each belt feeds a hopper above a 2-yard Smith tilting mixer.

Cement from the San Andreas plant of the Calaveras Cement Co., is shipped by freight in sacks to Valley Springs, the nearest railroad point. It is then hauled the remaining 3½ miles by two flat bed cement trucks which run over the trestle to cement silos directly above the mixers. The sacks are opened as they are removed from the trucks and the cement is dumped through grizzlies into the silos. A Blaw-Knox cement weighing batcher is hung beneath each silo. Cement is dropped from the batchers into the mixing hoppers.

CONCRETE IS CHUTED

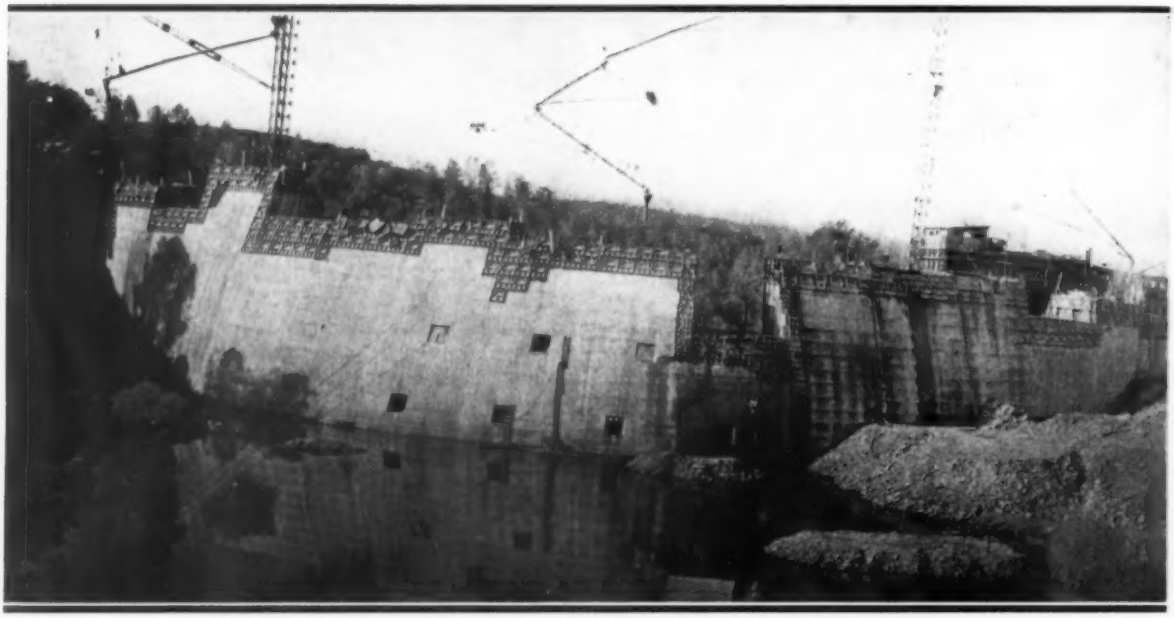
Concrete is fed into chutes, so arranged that either or both mixers will feed to the base of a 380-foot single compartment Insley steel tower, built practically integral with the mixing plant, or to a hopper. This hopper feeds a 30-inch conveyor belt which runs to a second Insley steel tower, 180 feet high and on the farther side of the canyon, 315 feet distant. The belt conveyor is carried on a suspension cable bridge. The bridge was selected rather than a conventional trestle because of the danger of a trestle being washed out during high winter floods. The mixer chutes are also arranged so that concrete can later be chuted directly beneath the mixers and to 1-yard buckets set on trucks. These buckets will be hauled to the extreme north end of the dam and there lifted from the trucks and elevated to the dam by a P & H crane.

On each tower a 90-foot boom is carried, on which is hung a 65-foot single counterbalanced chute. Two counterbalanced chutes, respectively 50 and 65 feet long, are hung on a 2¼-inch cable which runs over the center of the dam. These chute concrete to the center portion of the arch where the boom plant chutes do not reach. The north gravity abutment and the larger part of the north gravity wall are covered by a pair of 50-foot counterbalances, carried on a 25-ton derrick, set on top of a wooden tower 64 feet high. The derrick plant is fed, as are the counterbalances in the center of the arch, by a chute line run from the higher tower. Thus the entire dam is effectively covered. All chutes are 16-inch Insley steel chutes.

ALL CONCRETE TESTED

Concrete is placed under the personal supervision of

L. H. Tuthill, concrete technologist, who maintains a testing laboratory on the job. Mixing and placing have been handled so as to give a minimum of segregation. A maximum slump of 4 inches and a 28-day compressive strength of 1,500 pounds are required. Daily strength tests have shown an average of over 2,500 pounds per square inch at 28 days. The mix is varied to meet conditions at the gravel pit, but is approximately 1 part cement to 4 parts fine aggregate to 6½ parts coarse aggregate. There is 0.92 barrels of cement used per cubic yard of concrete. Three sizes of rock and sand are used, with cobbles up to 5-inch being required. Mr. Tuthill deserves much credit for his helpful attitude toward the contractor and for his ability to get a workable, high strength, impermeable concrete using, as nearly as possible, aggregates as they happen to run at the pit.



Looking Downstream at the Stream Bed Arch Section of the Calaveras Dam

ELECTRIC POWER USED

A 650-cubic foot Ingersoll-Rand air compressor and a Caterpillar Thirty tractor are also included in the equipment. The trucking is subcontracted. Except for the digging machines, all of the general contractor's equipment is electrically operated. The P. G. & E. Co. has erected an 11,000-volt transmission line from Valley Springs to the job and installed 300-kv transformers near the mixing plant. Bent Brothers, Inc., has erected an 11,000-volt branch line 4,000 feet long to the gravel plant, and installed 100-kv transformers near that plant. Power service has been satisfactory and the power factor quite steady.

The construction plant includes a machine shop, drill sharpening shop, carpenter shop and completely equipped rigger's loft.

THE CONSTRUCTION CAMP

Camp facilities were provided for 300 men in order to speed up plant erection and river bottom excavation. These included 47 four-man bunk houses and 24 large tents, mess house, commissary, first aid hospital, 30,000-gallon water storage tank, engineer's office, contractor's office, guest house and ten-family houses. The number of family houses is small because of the short construction period. The tents have since been removed, as the crew is not expected to exceed 150 men during the rest of the job. All camp operations were contracted to the Anderson Boarding & Supply Co., of San Francisco and Los Angeles. Water for the camp supply and construction purposes is pumped from the river to the storage tank and is chlorinated at the pump. Daily samples are tested in the First Aid Hospital maintained at the job by J. W. Newton, M.D. of San Andreas. All of the contractor's job business is handled through the local office.

PERSONNEL

Lyle Peyton is City Engineer of Stockton and is in charge of the project, W. B. Hogan being City Manager. W. S. Post is Resident Engineer on the work and Sam Thomas is his assistant. Louis C. Hill and Fred H. Tibbetts have been the consulting engineers on this flood control dam. L. T. Grider is General Superintendent for Bent Brothers, Inc., with the writer in charge of this project.

Building a Small Concrete Arch Bridge in Cold Weather

(Continued from page 65)

On Sunday morning at 9:30 the second pouring was started and was continued throughout the day until two more sections were finished. When these two sections had set, the balance of the arch was poured, taking 280 cubic yards of mix, making 700 cubic yards of concrete for the arch alone. For the balance of the concrete work it is expected that 800 cubic yards will be needed, making a total pour of 1,500 cubic yards to finish the bridge.

The work was in charge of "Butch" Martin for the Walsh-Kahl Construction Co.

Uncle Sam to Count Contractors' Noses for the First Time

By

Dr. Alanson D. Morehouse

Chief, Construction Section, Division of Distribution

U. S. Bureau of the Census

Federal Census Will Gather Comprehensive Information on the Construction Industry

THE first Census of the Construction Industry ever undertaken by the United States Government is now under way as a part of the 1930 decennial census. It is being taken at the urgent request of the contracting group of that industry, as, for many years, leaders in the industry have realized the necessity of obtaining more complete and accurate statistics of their business in order to promote efficiency in the conduct of the construction industry. While in the past they have been largely forced to use estimates and general assumptions, it is now expected that essential facts will be available for this purpose as a result of the census. It will be particularly pertinent information at this time when President Hoover is emphasizing the importance of public works construction as well as private construction, as "the balance wheel of American Industry," in securing and maintaining general prosperity throughout the nation. The figures obtained will also furnish the basis for further statistical research of an even more intensive nature.

Construction statistics have previously been gathered by various private agencies to serve certain particular purposes, but a comprehensive census, such as that now contemplated, is, of course, not feasible for such private agencies to undertake. Statistics on building permits, in cities where such permits are required, have been gathered for years but they have fallen far short of giving a complete picture of the situation. Public buildings for Federal, State, County, and Municipal Governments and quasi-public or community buildings such as churches, colleges, institutions, etc., more often than not, do not require permits, also a great amount of building construction has been done outside the corporate limits of cities, in which case no permits are required. Engineering construction such as railroad work, sewers, waterworks, and the like, are not covered by permits. Other private agencies for many years have been gathering statistics on the values of contracts awarded, but such statistics have not completely covered the United States nor have they covered much of the smaller construction work.

As a result of the present census, information will be available concerning the approximate number and kind of general contractors, subcontractors, and operative builders throughout the United States and the total value of work performed by them in the various states and cities during the year 1929. General contractors will classify themselves as building, highway, grading, waterworks, dredging, railroad and the other contractors. Similarly subcontractors will indicate whether they are engaged in carpentering, concreting, heating and piping work, electrical work, masonry, plastering, sheet metal work, marble and tiling work, or other trade. Questions regarding the number of skilled and unskilled workmen on the payrolls, and the total annual pay roll, will have a direct bearing on the matter of employment in this great industry which ranks second among all industries in the United States. It will also indicate the seasonal character of construction work of various kinds. The trend toward rental rather than the ownership of construction equipment in the endeavor for greater efficiency and lower unit costs will also be disclosed, as well as the various items of ex-

Help Make This Job Complete

Every contractor is urged to facilitate the collection of facts about the Construction Industry now being enumerated by the Bureau of the Census. Never before has the Federal Government shown any interest in the Contractor but has confined its census to individuals and manufacturers. The magnitude, strength and solidarity of this great industry will be much more apparent to the Government, its Departments and the political parties than ever before.

Do Your Part!

pense, such as rent, liability insurance, bond premiums, and all other overhead expenses. This "cost of industry" will be of value to each individual concern engaged in any particular type of construction, enabling them to compare their overhead expenses with the average overhead of concerns in their line, thus informing them as to whether or not they are in line with their fellow contractors and spurring them on to greater efficiency in their methods.

Although only contractors whose gross business during the year 1929 exceeded $25,000 are required to fill out the report-blanks, it is estimated that upwards of 150,000 contractors or contracting firms will be canvassed. Initially this work will be conducted by mail, the report-blanks being sent directly to the individual contractors. It is possible that later on the assistance of the special field agents of the Census of Distribution may be required in order to complete the canvass. All contractors whose gross business for the year did not reach $25,000 are requested to note that fact on the report and return it to the Bureau of the Census in order that their names may be removed from the card files so they will receive no further requests for information during this census.

In general the inquiries on the report-blanks are designed to obtain information of the number of salaried employees and total salaries paid; the number of skilled and unskilled workmen employed on specific dates or nearest normal working day during each month of the year; total wages paid them during the year; the working days per week; time lost due to strikes, lockouts, and accidents; equipment investment and cost of rented equipment; rents, interest, bond premiums, compensation and liability insurance paid; the types and values of general contract and subcontract work performed; the total value of the year's operation by type of work, by class of construction, and also by class of ownership; the value of construction in the city in which the firm's office and each branch office is located, also in the state excluding such city, and in other states; and finally the value of the various materials used and building equipment installed on the various construction projects. Manufacturers and lumber and material dealers will be able to gain much valuable information from the last-mentioned item, showing them the location and size of their prospective markets for all their various lines. No attempt, of course, will be made to ascertain in any way an estimate of the contractors' profits.

Replies to the inquiries are required by Act of Congress. All information furnished by the individual contractor will be held in strict confidence. It will not be used as a basis for taxation, but only for statistical purposes. Only employees of the Bureau of the Census, sworn to secrecy, will be permitted to examine the reports, and the information when analyzed and made available will not disclose, exactly or approximately, any of the figures in any individual report.

A committee representing contractors' associations and the advisory committee on distribution composed of nationally known business men appointed by the Secretary of Commerce, and various persons informed on construction matters, have materially assisted the Bureau of the Census in the preparation of the report-blanks and are otherwise helping in the prosecution of the work. The construction section handling this Census of the construction industry is a part of the Census of Distribution of which Dr. Robert J. McFall, Chief Statistician for Distribution, is in charge. The entire distribution census is a new expansion of the Bureau of the Census, which under Director William M. Steuart, has kept constantly growing in response to the urgent demands of business and industry.

Mailing of the construction report-blanks has already begun, the time set for the return of the reports being 15 days after their receipt by the contractor. As soon as all reports are received for any city or state, so that the results may be tabulated, they will be published in preliminary form. While some of the questions asked may seem burdensome or superfluous, each of them has been carefully considered by the contractors' committee and all others concerned in preparing them, and they were considered necessary to obtain a true picture of the activities and tendencies of the construction industry.

The benefit of this census comes primarily and chiefly to the contractors themselves, who should keep in mind that the results of this first effort towards obtaining a comprehensive understanding of their great industry will depend upon their cooperation and upon the completeness and promptness with which they fill out the reports.

Cleveland Goes Wall Street One Better

THE Board of Directors of the Union Trust Co., Cleveland, Ohio, was just as considerate of the occupants of neighboring buildings as was the Board of the Irving Trust Company of New York, but saved themselves the humiliation of making apologies, when they decided to add another floor to their present building, by specifying that the steel be arc welded.

The New York company sent engraved notes of apology to more than 500 neighbors recently, when they let the contract for the erection of a 54-story building at Broadway and Wall Street. The President of The Irving Trust Co. anticipated the distracting noise of the riveters, and asked his neighbor's indulgence "during the unavoidably noisy weeks that lie just ahead" while the steel frame of the building was being erected.

Cleveland's trust company, however, had no apologies to make. There was to be no noise. The steel for the new story, which is to house the Cleveland Stock Exchange, has been erected by the modern, noiseless process of electric arc welding.

This addition on the top of the existing building is 52 feet square. The steel frame was erected by extending the present columns, except in the case of the outside bay where it was found more convenient to set the columns in on the existing beams, and strengthen these beams sufficiently to carry the added weight. This strengthening was done by welding a 24-inch I-beam between the vertical columns under the existing beams. In all other cases the existing beams will serve as the floor for the new story.

The steel in this addition was erected by the Republic Structural Iron Works. The welding current was furnished by Stable-Arc welders manufactured by The Lincoln Electric Co., Cleveland, Ohio. This new addition to the Union Trust Co.'s building, designed by Fox, Duthie & Foose, is one of the few structures in Cleveland fabricated by arc welding. It is expected that this process will become more widely used in the future, however, due to the recent announcement of the Austin Co., who state they are now offering welded construction as a regular part of their service, making welding or riveting optional with the owner of the building that is being erected.

Photo by Schoenhals

AN AIRPLANE VIEW OF THE CONSTRUCTION OF THE NORTH BEACH AIRPORT SHOWING THE BULKHEAD AND SLUICING OPERATIONS AND THE EXISTING HYDROPLANE BASE AT THE RIGHT
The white line indicates the boundary on the land side of the new airport

From Beer Garden *to* Airport

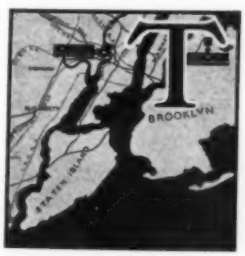
New Hydro and Airplane Base of New York Air Terminals, at North Beach, L. I., Created by Rock Fill from Subways and Sluicing of Low Hills and Dredging of Channel

By

J. W. Adams

Resident Engineer

New York Air Terminals, Inc.



TWENTY years ago when the old German beer garden at North Beach, L. I., was in its heyday with hochs and prosits filling the air and joyful sounds crowding the merry-go-rounds, roller coaster, tin-type and photograph studios, to say nothing of the vine-covered beer garden itself, no one thought that this area would eventually become an important airport in a chain being developed by one organization, the New York Air Terminals, Inc., now a part of Curtiss-Wright Airports, Inc.

Hydroplane Base

The hydroplane base was completed and placed in operation in May, 1929. It consists of a timber ramp extending into the water and leading to an asphalt macadam apron in front of a large steel hangar, measuring 120 x 120 feet and accommodating about nineteen planes. Inasmuch as this location is only 15 minutes from East 42nd Street, New York City, by fast motor-

A Typical Scene Showing a Gas Shovel and the Stumps Which Were Moved and Burned or Buried

boat, it has been made the terminal for hydroplane service to Albany, N. Y., Boston, Mass., Atlantic City, N. J., and for pleasure trips. It is also a terminal for the aviation unit of the New York Police Department which maintains a Loening and a Savoia-Marchetti plane here. In February, 1930, the construction and erection of a second hangar for hydroplanes was started.

TOPOGRAPHY

The topography of this 65-acre tract, which is being converted into a 200-acre field by the use of bulkheads, is of interest as it led to the type of dirt handling decided upon. The average elevation close to the shoreline was about 10 feet above high water, rising thence about another 35 to 50 feet at the farthest point from the water. The tract of land is L-shaped, as shown in the airplane view, thus making it possible to have runways in all directions. The area is a glacial drift but had a number of streets paved with granite blocks which were rather troublesome in the sand pumps which were used to dispose of the sluiced material.

BULKHEADS

In order to enlarge the area from 65 acres to 200 acres, a large stone bulkhead was thrown out into the water along the line set by the U. S. Army Engineers. The base fill for this bulkhead was from subway excavation hauled in by Patrick McGovern, Inc., Metropolitan Brick Co., Jackson Avenue Dumping Co. and others, and by the Moran Contracting & Towing Co., which delivered bargeloads of stone which were unloaded by derricks. This area furnished an accessible dump for these materials which are rather difficult to dispose of around New York City. A rather novel feature of the fill which attracted considerable newspaper publicity was the disposal of old automobiles in the lagoons back of the stone. The Borough of Queens had been troubled with a large number of derelict automobiles left in streets and surreptitiously run off the piers and docks. The North Beach fill gave them an excellent opportunity to dispose of several score of old machines definitely so that they would be truly out of sight and out of mind. The first machine which was brought in for disposal in this manner was sponsored by Borough President Harvey.

HIGH PRESSURE WATER SYSTEM FOR SLUICING

Salt water from the East River was pumped by a direct-connected Allis-Chalmers pump and motor with 12-inch suction and 10-inch discharge for sluicing operations. The pump was mounted on a platform out over the water and, operating at 1,200 rpm against a 462-foot head, delivered 5,000 gallons per minute. Two pits were operated during the major part of the sluicing with two guns and one sand pump in each pit.

SLUICING

Eight-inch Taylor spiral pipe was used for the gun line equipped with Georgia Iron Works valves. A gun crew consists of one man on the gun, eight laborers and a foreman. Each of the sluicing pits was equipped with 4 General Electric floodlights for 24-hour operation, each shift working 12 hours. There was also a large incandescent light directly over the sand pump.

Whenever the guns ran into an excess of large stone, one of the five power shovels on the job was run into the pit to clean up, loading to motor trucks which carried the stone directly to the fill. The sluiced material was guided by planks well staked so that the stream was kept in a narrow path to insure maximum effect. The streams from both guns in one pit delivered to a central sump which was attended by one laborer.

Stumps which showed up in the sluicing operations were picked up by the shovel and loaded on trucks so that they could be hauled out, dried and later burned or buried. Boulders which were too large to handle with the shovels were mud capped and thus reduced to easily manageable dimensions.

SAND PUMPING

At the sump a 12-inch suction Georgia Iron Works sand pump with a 12-inch discharge of cast iron pipe and operated by a 300-horsepower General Electric motor, was installed. Ahead of the suction was a screen of iron rods to keep the large stones out of the section of the sump in which the pump was working.

The pump motor and transformer were mounted on

A House That Was Completely Demolished by Sluicing Out the Ground Under the Foundations and Then Burning the Wreckage

skids and housed so that they could be moved as a unit to any place necessary.

The two guns in each pit with 2¼-inch nozzles and operating at 210 pounds pressure furnished enough material to the sand pump so that it was able to handle about 350 yards per hour, pumping a distance of about 850 feet. The sand pump was equipped with 36-inch cast iron runners which were later replaced with 34-inch steel runners to make it possible to handle larger stone through the pumps. The pumps were run at about two-thirds efficiency.

In order to keep the pumps primed and working to the best efficiency, a loop was placed in the line in which the pipe was raised to height of about 15 feet above the grade.

Sluicing operations were completed the last of January and then the five power shovels handled the clean-up with the assistance of a Caterpillar Sixty with a LaPlant-Choate hydraulic bulldozer.

A total of 450,000 cubic yards of material was handled by shovels to trucks which dumped in the lagoons and 880,000 cubic yards was sluiced at a unit cost of less than 20 cents a cubic yard, the entire operation being handled in three months.

DREDGING

In order to complete the filling of the lagoon an additional 1,000,000 cubic yards of material will be dredged during the spring. The material is to be obtained by dredging a 30-foot channel from Rikers Island Channel to the motorboat landing of the hydroplane base.

OLD DOCK AND SCOWS DEMOLISHED

An old dock which was used by a ferry from Long Island was located just inshore from the bulkhead line. When the rock was being dumped from scows in this section, the mud wave formed completely demolished the old dock making any special wrecking operations unnecessary. In this section, there were also a number of old scows and excursion boats which were stripped of all material which could be salvaged and were then burned and the remaining hulks buried in the fill.

PERSONNEL

The North Beach Airport of the New York Air Terminals, Inc., which now has become a part of Curtiss-Wright Airports, Inc., is being built by the same organization which constructed the Secaucus Airport described in the January, 1930, issue of CONTRACTORS AND ENGINEERS MONTHLY, page 121. W. F. Carey is President and Theodore Pyle, Chief Engineer of the New York Air Terminals, Inc. The construction operations are in charge of Mike Carey, General Superintendent, with the author as Resident Engineer.

PICTURE TAKEN NEAR THE END OF THE SLUICING OPERATIONS SHOWING TWO HYDRAULIC GIANTS AND THE SAND PUMP

The original grade is shown at the right and the approximate final grade at the left

Water Tamping of Embankments

THE new specifications of the New Hampshire State Highway Department on water tamping of embankments are interesting in that they require that all fills in excess of 3 feet on which concrete pavement is to be laid must be water tamped. This is to be done with water under pressure at a rate of not less than 30 gallons per minute. Jet holes are to be made at least 2 feet deep and not more than 5 feet apart. Into these holes the jet nozzles are to be inserted, delivering full pressure. When the water begins to overflow the hole or adjacent holes, the jet is to be forced down to the bottom of the fill, that is, natural ground, and be allowed to remain until the water overflows the hole or adjacent holes or oozes out of the side of the fill. This jetting is to be repeated at intervals of not less than 3 days if necessary in the opinion of the engineer to satisfactorily compact the embankment. This process must be completed at least 7 days prior to the laying of any concrete pavement.

After drying for not more than 4 days the whole surface over which final water tamping has been employed is to be thoroughly rolled with a three wheeled power roller weighing not less than 10 tons.

This is a new provision in the 1930 specifications which have been materially changed from those previously used in New Hampshire.

When Can You Work?

A Survey of Weather Conditions, Working Days and Bonus and Penalty Requirements in the 48 States

By

C. N. Conner

Engineer Executive

and

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Assistant Engineer

American Road Builders Association

APPROXIMATELY two years ago the American Road Builders Association began the collection and tabulation of data on average weather conditions, working days, and bonus and penalty clauses, throughout the United States. These data have been secured largely from the 1929 report on equipment of W. A. VanDuzer, Assistant Chief Engineer, Pennsylvania Department of Highways, from the United States Weather Bureau and from 48 State Departments. These organizations have made possible the detail in which this paper is prepared.

The item of working days, bonus and penalty in connection with all construction contracts have been from the first problems which have proved most troublesome to engineers and contractors.

The purpose of this report is to acquaint contractors with the requirements of the various states on the penalty and bonus clause and to furnish data on weather conditions which may be used by the contractor in planning work in other states than those in which he is accustomed to operate.

Working Days

The practice of the contractor bidding the number of working days and this item receiving a monetary consideration in the award is rapidly being discontinued, and is being replaced by a date set by the engineer for the completion of the work.

In the 48 states only 4 require or permit the contractor to bid the number of working days. In the other 44 states the date of completion is set by the State Highway Department. This fact should influence contractors to make a careful check of the average weather conditions for the immediate territory in which the project is located, in order that he may intelligently decide as to the equipment which he will place on the work and his method of procedure.

To aid the contractor in this respect we have carefully compiled a table showing the following information for the various sections of each state: working

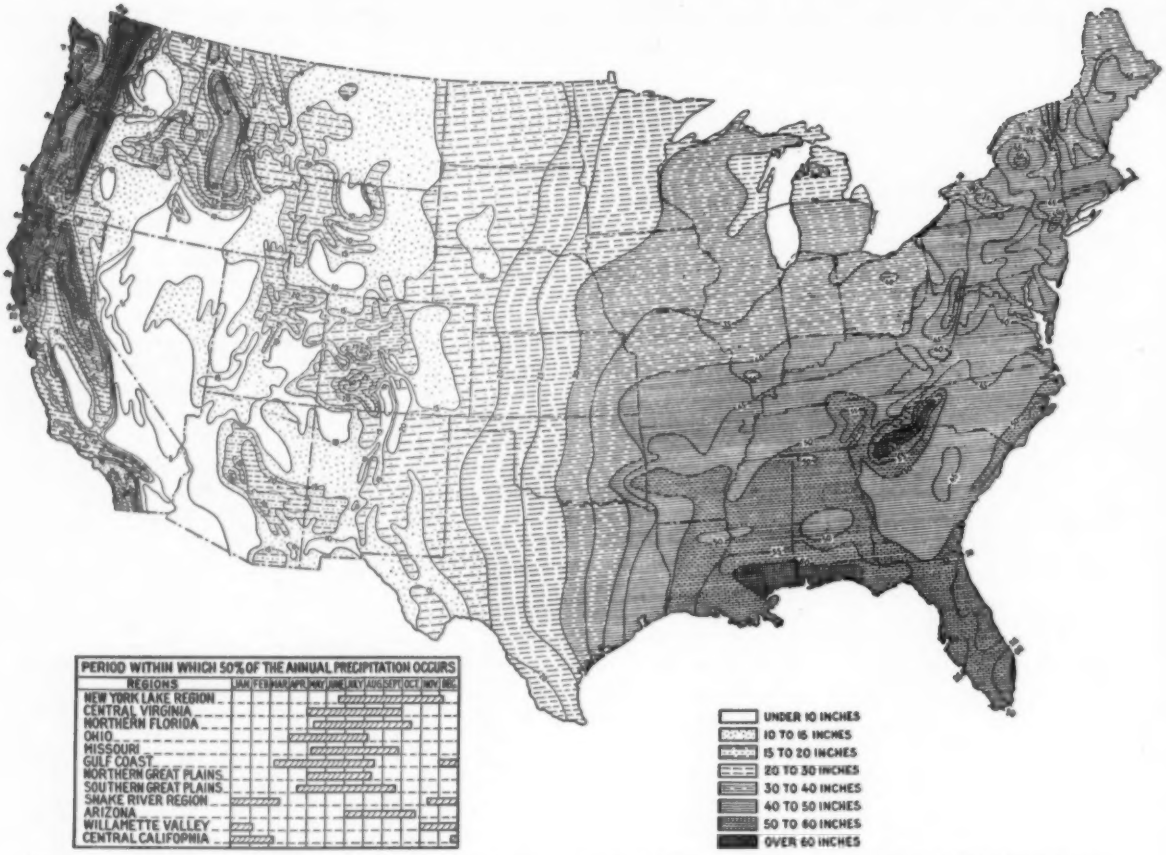
State	Days Bid By Contr.	Days Spec. By State	Penalty for Failure to Complete on Time	Bonus for Completion in Less Time
Ala.	No	Yes	$10–80 per day	$10–80 per day
Ariz.	No	Yes	Varies with amt. of contract	None
Ark.	No	Yes	$10–30 per day	None
Calif.	No	Yes	$50 per day	None
Colo.	No	Yes	Varies with Con.	None
Conn.	Yes	No	[1]	
Dela.	Yes	No	[1]	
Fla.	No	Yes	Variable with amt. of contr.	None
Ga.	No	Yes	$10–50 per day	$10–50 per day
Idaho	No	Yes	$25 per day	None
Ill.	No	Yes	$10 plus Eng.	None
Ind.	No	Yes	All ex. costs	None
Iowa	No	Yes	None[2]	None
Kansas	No	Yes	$10–50 per day	None
Ky.	Yes	Yes[3]	Varies wih amt. of contract	None
La.	Yes[4]	Yes	Extra Eng.	None
Maine	Yes	No	[1]	[1]
Md.	No	Yes	$10 per day	$10 per day
Mass.	No	Yes	$25 per day	None
Mich.	No	Yes	Extra Eng.	None
Minn.	No	Yes	$10–30 per day	None
Miss.	No	Yes	Extra Eng.	None
Mo.	No	Yes	$15 per day	None
Mont.	No	Yes	$15 per day	None
Nebr.	No	Yes	None	None
Nevada	No	Yes	Extra Eng.	None
N. H.	Yes	No	$25–50–100	$25–50–100
N. J.	No	Yes	$10–50 per day	None
N. Mex.	No	Yes	Extra Eng.	None
New York	No	Yes	Extra Eng.	None
N. Car.	No	Yes	Extra Eng.	None
N. Dak.	No	Yes	Extra Eng.	None
Ohio	No	Yes	Contract void	None
Okla.	No	Yes	$10–75 per day	None
Oregon	No	Yes	Extra Eng.	None
Penna.	No	Yes	$10–80 per day	None
R. I.	No	Yes	$10 per day	None
S. Car.	No	Yes	$10–25 per day	$10–25 per day
S. Dak.	No	Yes	Extra Eng.	None
Tenn.	Yes	No	$10–80 per day	None
Texas	No	Yes	$10–35 per day	None
Utah	No	Yes	Extra Eng.	None
Vermont	No	Yes	Extra Eng.	None
Va.	No	Yes	$10 per w. day	$10 per w. day
Wash.	No	Yes	$50 per day	None
W. Va.	No	Yes	Extra Eng.	None
Wisc.	No	Yes	Extra Eng.	None
Wyo.	No	Yes	Varies with contract	None

[1]See statement regarding Connecticut in text. [2]Contractor is required from the start to keep well organized crew of sufficient size on the work to insure completion within specified time. [3]State fixes maximum number of days which will be considered. [4]State uses both methods.

TABULATION OF WORKING DAYS AND CLIMATIC CONDITIONS IN THE SEVERAL STATES FOR HIGHWAY CONSTRUCTION

State	Portion	*Working Days		Mean Annual Precipitation	Temperature		Mean Frost Date	
		Grading	Paving	Inches	Mean High	Mean Low	Spring	Fall
Ala	N. & W.			49.00	105	— 9	Apr. 25	Oct. 15
	E. C. & S.	240	240-300	55.32	105	0	Apr. 20	Oct. 15
Ariz.	Southern			10.95	113	+ 9	Apr. 15	Oct. 25
	Northern	200-300	200-300	16.12	107	—10	June 1	Sept. 29
Ark.	Southern			46.22	108	— 9	Mar. 20	Nov. 10
	Northern	300	300	47.25	109	—17	Apr. 15	Oct. 15
Cal.	Southern			14.10	110	+15	Apr. 10	Nov. 1
	Central			18.85	111	+17	Apr. 20	Oct. 15
	N. Eastern			34.81	108	+ 4	June 1	Oct. 5
	N. Western	135-300	120-300	40.22	107	+14	May 25	Oct. 15
Colo.	S. Eastern			17.30	99	—30	June 15	Sept. 15
	N. Eastern			16.88	99	—32	June 25	Sept. 15
	Western	No Data	No Data	17.03	94	—33	July 1	Sept. 5
Conn.		180-210	125-155	42.01	99	—24	June 5	Sept. 10
Chesapeake Bay Region				42.82	104	—11	May 5	Oct. 25
Delaware	(See Chesapeake Bay Region)			(Grading 220 Days)			(Paving 160 Days)	
Fla.	Northern			53.60	103	+10	Apr. 15	Nov. 1
	Southern	240	240-up	41.43	99	+22	Mar. 10	Dec. 1
Ga.	Western			52.48	104	— 4	Apr. 25	Oct. 20
	Cent. & East.	300	300	49.44	107	— 2	Apr. 20	Oct. 15
Ida.	Northern			23.22	103	—24	June 25	Sept. 1
	Southern	120-200	80-120	14.56	105	—29	July 1	Sept. 1
Ill.	Northern			33.12	107	—27	June 1	Sept. 15
	Central			36.04	106	—25	May 15	Sept. 20
	Southern	180-240	125-135	41.41	109	—20	May 10	Sept. 25
Ind.	Northern			36.07	105	—23	May 25	Sept. 15
	Southern	160-175	120-140	42.52	107	—22	May 15	Sept. 20
Iowa	Western			32.39	108	—36	May 20	Sept. 15
	Central			32.39	108	—33	May 20	Sept. 15
	Eastern	175	125	32.39	107	—31	May 25	Oct. 5
Kan.	All	200	140	28.50	111	—27	Apr. 25	Oct. 20
Ken.	Eastern			46.87	104	—20	May 10	Sept. 25
	Western	175	100	45.40	106	—21	May 10	Sept. 25
La.	Southern			56.37	106	+ 7	Mar. 10	Nov. 15
	Northern	225	225	49.32	107	— 2	Apr. 20	Oct. 20
Maine	All	140	110	40.66	98	—29	June 15	Sept. 10
Md.	W. & Cent.	(See Potomac River Basin)						
	Eastern	180-240	140	(See Chesa. Bay Region)				
Mass.		225	150	42.01	99	—24	June 5	Sept. 10
Mich.	Upper Penin.			30.00	99	—37	June 15	Sept. 1
	Western Lower			31.00	102	—29	June 5	Sept. 10
	E. Lower	180	130	32.00	103	—29	June 15	Sept. 10
Minn.	S. Western			25.31	104	—38	May 15	Sept. 25
	S. Eastern			28.65	105	—40	May 15	Oct. 1
	Northern	150	100	24.98	102	—48	June 15	Sept. 1
Miss.	Northern			49.30	104	— 6	Apr. 25	Oct. 10
	Southern	240	160	55.82	104	+ 2	Apr. 20	Oct. 20
Mo.	S. Western			40.00	109	—27	May 15	Sept. 20
	S. Eastern			44.98	109	—24	May 15	Sept. 25
	Northern	No Data	No Data	36.67	109	—36	May 15	Sept. 25
Mont.	S. Eastern			14.35	106	—45	June 10	Sept. 1
	S. Western			15.05	101	—43	June 20	Aug. 20
	Western			17.82	102	—33	June 20	Apr. 25
	N. Central			16.00	102	—46	June 20	Aug. 25
	N. Eastern	No Data	100-120	14.27	108	—32	June 15	Aug. 25
Neb.	N. Western			19.75	106	—35	June 5	Sept. 10
	N. Eastern			27.75	109	—36	May 25	Sept. 15
	Southern	250	225	25.00	111	—33	May 25	Sept. 15
Nev.	All	240-300	150-175	7.21	106	—21	June 25	Sept. 1
N. H.		140	100	42.01	99	—24	June 5	Sept. 10
N. J.	S., I. & Coast			47.68	103	—10	May 20	Sept. 25
	Northern	190	140	47.44	104	—18	May 20	Sept. 20
N. M.	W. & S.			13.43	113	—18	May 7	Oct. 20
	N. Western			14.09	100	—22	June 15	Sept. 25
	N. Eastern	No Data	No Data	17.87	102	—20	May 25	Oct. 1
N. Y.	Western			35.20	99	—23	June 10	Sept. 10
	Central			39.09	98	—30	June 10	Sept. 10
	S. Central			38.76	99	—30	June 15	Sept. 10
	Eastern	160	150	41.68	100	—24	May 25	Sept. 15
N. C.	E. & W.			51.66	98	—16	May 20	Sept. 25
	W. Central			51.46	102	— 7	May 5	Oct. 5
	C. & S. E.			48.06	104	— 4	May 5	Oct. 10
	N. Eastern	200	200	48.23	102	— 2	Apr. 25	Oct. 15
N. D.	Western			15.69	105	—47	June 15	Aug. 25
	Eastern	150	180	19.26	105	—46	June 15	Aug. 20
Ohio	Northern			36.74	104	—23	June 1	Sept. 15
	S. Western			39.36	105	—24	May 20	Sept. 25
	S. Central			38.68	105	—26	May 25	Sept. 20
	S. Eastern	No Data	No Data	39.38	104	—26	May 25	Sept. 20
Okla.	Eastern			38.75	110	—14	Apr. 25	Oct. 10
	Western	225-240	225-240	30.00	112	—14	May 1	Oct. 1
Ore.	Western			51.44	101	— 5	June 1	Sept. 25
	Eastern	No Data	No Data	14.00	104	—24	June 20	Sept. 10
Pa.	Western			41.41	103	—14	June 5	Sept. 15
	Central			40 08	103	—24	June 5	Sept. 15
	Eastern	193	129-140	46.09	103	—18	May 20	Sept. 20
Potomac	River Basin			39.37	104	—19	May 15	Oct. 5
R. I.		190-200	140-150	42.01	99	—24	June 5	Sept. 10
S. C.	Western			48.75	105	— 1	Apr. 20	Oct. 15
	Eastern	210-240	180-240	47.16	105	+ 2	Apr. 15	Oct. 20
S. D.	Western			18.50	108	—40	June 1	Sept. 5
	Eastern	130-165	110-140	22.30	107	—42	June 25	Sept. 1
Tenn.	Middle West			50.83	104	—18	May 15	Oct. 1
	Eastern	190	175	51.66	98	—16	May 20	Sept. 25
Texas	N. Western			24.50	109	—10	May 10	Oct. 15
	Central			26.50	110	— 4	Apr. 25	Oct. 20
	Eastern	240-300	180-240	40.00	111	— 5	Apr. 25	Oct. 20
	Southern			31.88	107	+ 8	Apr. 5	Oct. 25
	W. & S.			13.43	113	—18	May 7	Oct. 20
Utah	Eastern			11.13	104	—25	June 20	Sept. 10
	Western	170-180	170-180	13.93	103	—23	June 25	Sept. 10
Va.	South & S. W.			43.60	100	—19	May 20	Sept. 25
	S. & E.			42.87	102	— 4	Apr 25	Oct. 10
	Central	180-210	150-180	41.60	104	—13	May 15	Oct. 5
Vt.		155	115	42 01	99	—24	June 5	Sept. 10
Wash.	Western			49.14	97	0	May 25	Sept. 25
	Eastern	180-300	150-240	15.48	107	—24	June 25	Sept. 15
W Va.	Northern			45.84	103	—26	May 30	Sept. 25
	S. & S. W.	No Data	120-180	43.60	100	—19	May 20	Sept. 25
Wis.	N. Western			30.00	100	—43	June 10	Sept 5
	Central			32.00	102	—41	June 10	Sept. 5
	Eastern	140-150	110	31.40	106	—32	June 1	Sept. 20
Wy.	Western			16.04	94	—46	July 15	Aug. 10
	S. Eastern			14.28	98	—38	June 20	Aug. 25
	N. Eastern	200	140-160	13.03	101	—38	June 20	Aug. 20

*Average for entire state; number of working days per year exclusive of Sundays, holidays and bad weather.



Weather Map Showing the Annual Rainfall in Inches and the Period Within Which 50 Per Cent of This Precipitation Occurs by Regions

days for grading, working days for paving, mean annual precipitation, mean high temperature, mean low temperature, mean frost date—Spring and Fall.

These data show average weather conditions which when applied give the following conclusions:

Grading—Working days vary from 140 to 300.
Paving—Working days vary from 100 to 300.
Precipitation ranges from 7.21 inches to 55.82 inches.
Maximum average high temperature 113 degrees in Arizona and New Mexico.
Minimum average low temperature 52 degrees below zero in Montana.
In Florida the average last date of frost in the Spring is March 10, and the first in the Fall December 1.
In Wyoming the last frost in the Spring averages July 15 and the first frost in the Fall averages August 10.

This table in its entirety is printed on page 81.

Penalty and Bonus

A recent canvass of the State Highway Departments of the 48 states discloses that all of the states inflict upon the contractor a penalty for failure to complete work on time. This penalty is variable in form but the one commonly used is the practice of charging the contractor with the additional cost of engineering required by his failure to complete the work within the time specified. Other forms of penalty include a specified sum incorporated in the contract as liquidated damages to the State and immediate forfeiture of contract. Of the 48 states, 9 specify a bonus for the completion of work ahead of time. The bonus is usually set up along with the penalty on a basis of a definite monetary consideration per day. In other words, on a contract of a definite total monetary value the penalty for failure to complete on time is a stated amount for each day overtime and a bonus of equal amount is given for each day that the contract is completed ahead of the stated time.

The method of penalty and bonus used successfully by the State Highway Department of Connecticut is worthy of particular mention. This method is to specify that liquidating damages at a certain daily rate will be charged for each day that the contract is in operation. This daily time charge is deducted from each monthly estimate as the work progresses. No specified number of days is set by the Department. The contractor estimates the days it will take him to complete the work and adds to his unit prices an amount sufficient to cover the total time charge for the number of days that he figures it will take him to do the work. Of course in this case he is gaining when the work is completed in a less number of days than he estimated, while in cases where a greater number of days are taken to complete the work, there is a direct loss to the contractor. This method is also used to some extent in one or two other states.

When Can the Penalty Clause Be Enforced?

Courts have ruled that a penalty clause for over-run in time cannot be enforced unless the contract carries a compensating clause with a bonus for completion of work ahead of the specified time. However, in many of the states penalties are inflicted on the contractor which, if the contractor resorted to law, perhaps could not be

collected. This may be explained by the fact that the contractor considers his objection to the penalty a poor economic measure in view of the possibility of impairing his good standing with the Department. The unfairness of the penalty clause without the compensating bonus is being more rapidly realized by State Highway Departments each season, with the result that 9 states are now incorporating in the contracts the bonus provision.

GIVE CAREFUL ATTENTION TO WEATHER PROBABILITIES WHEN YOU FACE A PENALTY CLAUSE

The exceptional wide ranges of weather conditions as noted and the variable requirements of the State Highway Departments in connection with working days, penalty and bonus are most certainly indicative of the necessity of these items receiving the most careful consideration from all bidders.

The policy of the American Road Builders Association is to make practical applications of such data and to form conclusions which are based on the combined judgment of contractors and engineers. It is evident that there should be sufficient interest to warrant a more extensive study of these problems so that useful conclusions can be developed.

Road Blazing in Virgin Forest

WHEN the new highway in Stratford, N. Y., is completed and open to traffic, the thousands of people driving over it will give but little thought to or scarcely realize the seemingly insurmountable difficulties the contractors met and had to overcome before another road of sand, stone and concrete could be laid. The casual observer driving over this road will see that it was blazed through a virgin forest and cut in part through a steep, rugged mountain, but even the most observing will never be able to visualize the wild rugged boulder and rock strewn scene of construction which the contractors will never be able to forget.

Navigating with a Heaped-Up Load

At one time in the process of clearing, the Empire State Construction Co., the contractor, found itself at a standstill. The heavy crawler tractors and wagons which were in use continually jack-knifed because the going was so impeded with huge rocks, stumps and other obstructions. Not only did these tractors and wagons knife when they backed up, but the equipment suffered severe breakage. And this was only one kind of trouble. When the tractors and wagons did drive over a swamp they were mired, and it was impossible to make the slightest progress. Then came a rain storm, and the contractor might just as well have been without equipment, that which he had proved so useless.

There was a time penalty on the job, and things began to look rather dark for the contractor. At this juncture he added two Iron Mules to his equipment. These Iron Mules, the short haul dirt movers, were as much at home in the rock-ridden, stump strewn, mountainous going on this job as a mountain goat would be. They climbed the grades, clambered over rocks and stumps with their tough, gripping crawler tracks, and because these tractor dumps build their own road as they go, they went through bog and mire without trouble. The 4-yard Mules which were used on this job have a front drive, pulling the load instead of pushing it, with crawler tracks and dumping controlled by power hoist. With the assistance of these Mules the contractor was able to overcome the difficulties of the job and complete the road on schedule.

Typical Rough Terrain Over Which the Iron Mules Operated

2,133 Feet of Concrete Per Day Helped to Solve Detour Problem

ONE paving outfit last year in Illinois built 21 miles of 18-foot wide hard pavement in 20 weeks. Not so long as 15 years ago a month was scarcely sufficient to construct a single mile of concrete. The modern highway paving job bespeaks efficiency as much as the making of tin cans, buttons or automobiles. Equipped with machinery that quickly converts sand, stone, water and cement into concrete, the modern road builder is now able to cope with the automobile which insatiably demands new roads.

There was a time when motorists of the community shuddered when they learned that a pavement was to be laid, for they knew that perhaps the roadway would be closed for a year. Nowadays the fear of the detour exists only in mild form for pavements are quickly thrown open to traffic and highway builders generally provide by-passes that hamper the motorist but little.

Picture this paving job. The contractor, one of thousands who know their business thoroughly, studied his task well before work was started. He installed an industrial railway, large material-handling plant and other devices necessary to the mass production of pavement. He determined that a small night shift that would take care of the details for the following day's run would be a good stroke of business. With everything in readiness and despite an extremely heavy rainfall, this one paving mixer marched down the roadbed, leaving behind in a single day's run as much as 2,133 feet of finished concrete.

Why Advertise?

A Question Raised by Many Contractors One Who Has Tried It Answers

Why Not?

By A. R. Hebenstreit

President, New Mexico Construction Co., Albuquerque, N. M.

IT is just as logical for a contractor to advertise to get people to spend money for sound improvements as it is for banks to persuade them to save their money. Thrifty citizens are good for banks and progressive citizens are good for a community. What is good for a community is good for every citizen in it, both from a business viewpoint and for making it a better place in which to live.

When we first began to use newspaper space it was with the idea that newspapers which were progressive in supporting the community were entitled to a certain amount of advertising space as a contribution toward their economic support. With this as a beginning, many have become ardent advertisers, whereas previously they were lukewarm toward it. During the first year or two so much evidence of reader interest accumulated that we laid out definite selling plans to make property owners conscious of the advantages of street paving.

Consistent Advertising Beneficial

We have kept this up consistently and are convinced that our advertising has been, to some extent, influential in making Albuquerque one of the best paved cities of its size (16,000 in 1920; 35,000 in 1930) in the country. The fact that our streets, alleys, and sidewalks have been paved, along with the other allied improvements, such as gas, water works, sewers, etc., several years in advance of present requirements, has stimulated growth, because growth is similar to other things in that it will follow the line of least resistence.

Only small space has been used, from ten to thirty inches a week in the two local newspapers, but since the realization of the possibilities of advertising we have always tried to make our messages energetic. The copy was developed along four distinct lines:

1. Paving promotes the growth of a city and raises property values at a nominal cost.
2. Paving protects health by checking the blowing about of germ-laden dust.
3. Paving denotes progress and builds community pride.
4. Paving reduces the cost of driving an automobile.

Four Themes with Variations

These themes have been played upon over and over again in as many variations as we could conceive. We have shown that paving, which establishes the street grade, encourages the cultivation of lawns and trees and flowers to beautify the city and makes homes more comfortable. We have shown that paving costs the owner of a 50-foot lot on a 32-foot street only 11 cents a day for the life of the bonds—less than the price of a package of cigarettes. We have reiterated that homes are more desirable on paved streets, and, aside from the greater comfort and more sanitary conditions, increased rents and selling prices themselves warrant the improvement.

Anyone who has undertaken to affect the public consciousness, even slightly, knows that it's a big task, and that results are more or less intangible. We have heard our own advertising thoughts repeated in street conversations and in public meetings. We have seen improvement petitions completed without a hitch. Many people have written letters to us discussing phases of the advertising. One correspondent suggested that if we believed what we were saying in the papers perhaps we'd be willing to buy his lots on a paved street for what they cost him. We wired back: "Sold," which proved that we were sincere in our statements.

Persistent Polite Pounding Produces Pondering

Even were there no such indications that people were reading our advertisements we would still consider it a privilege to be able to place our constructive ideas before the public. Because human nature is what it is, we would know that our continuous pounding away could not help but take effect. People don't like to be told things, but if the telling is done with courtesy and persistence their natural resentment wears away. Most people are fair minded. When the newness is off an idea, and it proves to be genuine, people unconsciously take it in and cherish it as their own. And when it comes to fundamentals, there is no argument about the benefits of street paving.

Our experience has proved, at least to our own satisfaction, that contractors have a definite advertising function. The entire construction industry exists by reason of progress, and through advertising it has the opportunity of smoothing the way for those who initiate improvements. There is a great deal of room for better understanding on the part of the public of methods, materials and purposes of construction. In a country as wealthy as ours there is capital enough to do a great deal more development than is actually done.

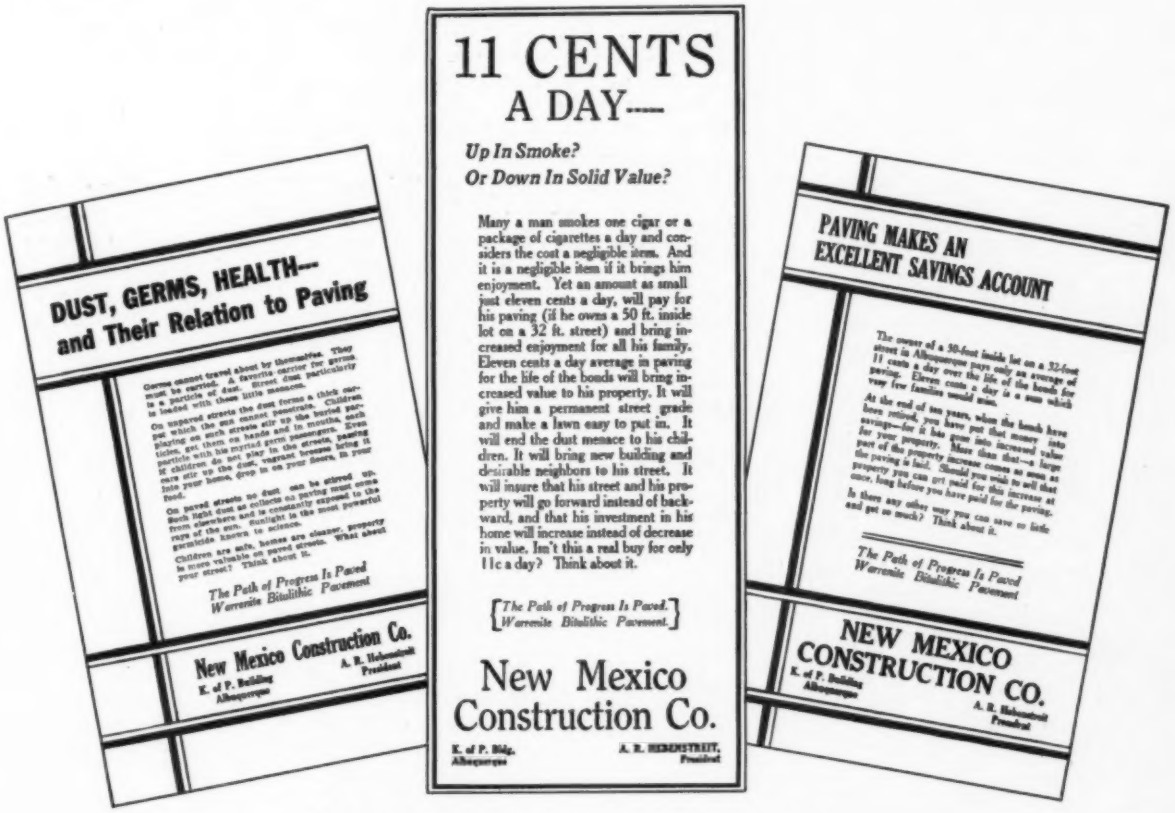
Construction men's progress has been carried up on a wave of necessary improvements, the last phase of pioneering a new country. They should visualize the greater accomplishments that are possible, and find a way, through advertising, of making others see them.

Advertising by the men who carry out the actual work of construction would tend to emphasize the better methods that return the most for invested capital. A country that spends as much money as ours for the development of its resources ought to know more about getting dollar-for-dollar value, and advertising is the only 365-day per year medium.

INDIVIDUAL OR GROUP ADVERTISING

Our own advertising has been, for the most part, individual but we are not at all opposed to the idea of group advertising. On occasions we have joined with others to help promote interest in public improvements. We think there is a big opportunity for permanent cooperative efforts of this kind.

Most contractors, and perhaps rightly so, feel that they cannot afford advertising to promote progress. It is true that there is probably no business that entails the risk involved in contracting. The only off-setting favorable feature about contracting is that to those who are able to secure work in a highly competitive field, even on a small margin of profit, commensurate remuneration results from volume. Any contractor who has the courage to spend money to produce business with assurance that he is going to get his share of it, is entitled to favorable consideration from a growing community. The courage to advertise is pretty fair evidence that he should be successful in the competitive struggle which results in the survival of the fittest.


DUST, GERMS, HEALTH—
and Their Relation to Paving
The Path of Progress Is Paved
Warrenite Bitulithic Pavement
New Mexico Construction Co.
K. of P. Building
Albuquerque
A. B. Hekemeyer
President
11 CENTS
A DAY—
Up In Smoke?
Or Down In Solid Value?
Many a man smokes one cigar or a package of cigarettes a day and considers the cost a negligible item. And it is a negligible item if it brings him enjoyment. Yet an amount as small just eleven cents a day, will pay for his paving (if he owns a 50 ft. inside lot on a 32 ft. street) and bring increased enjoyment for all his family. Eleven cents a day average in paving for the life of the bonds will bring increased value to his property. It will give him a permanent street grade and make a lawn easy to put in. It will end the dust menace to his children. It will bring new building and desirable neighbors to his street. It will insure that his street and his property will go forward instead of backward, and that his investment in his home will increase instead of decrease in value. Isn't this a real buy for only 11c a day? Think about it.
[The Path of Progress Is Paved. Warrenite Bitulithic Pavement.]
New Mexico Construction Co.
K. of P. Bldg. Albuquerque
A. B. HEKEMEYER, President
PAVING MAKES AN EXCELLENT SAVINGS ACCOUNT
The Path of Progress Is Paved
Warrenite Bitulithic Pavement
NEW MEXICO CONSTRUCTION CO.
K. of P. Building
Albuquerque
A. B. Hekemeyer
President

Three Advertisements Featuring the Value of Construction

Planning Steel Erection for Speed in Cincinnati

STEEL setting for the new 48-story Starrett Building at Fifth and Vine Streets, Cincinnati, Ohio, went on at a remarkable pace due to planning and a novel sequence of erection. Work on the skyscraper was carried on from the center of the project outward, speeding up the construction and materially aiding public safety. Construction towers were erected immediately on the arcade driveway. The floor of the arcade and the patio were specially reinforced making a solidly constructed street upon which all steel and other materials were carried directly onto the property.

Starrett Bros., Inc., of Illinois, general contractors for the development, let the steel contract for the building to the American Bridge Co. The contract called for 15,000 tons of structural steel representing a total cost of $1,500,000. The rapid construction plans call for progress at the rate of 4 stories in the first week and a floor a day thereafter until the building was completed.

How the Other Fellow Did It

Construction Briefs

Backing Loaded Trucks to the Dump Is Sometimes Advantageous

15. On short haul work, that is, hauls up to 400, 500 or 600 feet, much time can often be saved by shuttling trucks, that is, backing them under load to the dump and driving them forward to the shovel. A skillful truck driver will soon learn to back a truck to the dump almost as easily and accurately as he can drive it forward. The distance over which it pays to shuttle trucks depends on whether the time lost due to slow speed in backing is compensated for by the saving in turning time. In theory there is a wide difference between normal driving speed ahead and in reverse. In practice, the observed backing speed is usually relatively high when compared with the forward hauling speed. Where this is true and the turning time is large, the distance over which shuttling can be done to advantage is considerable.

Shuttling is not resorted to as often as it ought to be nor for as great a distance. On short hauls up to 200 or 300 feet, shuttling the trucks sometimes nearly doubles their output. It also improves operating conditions as where trucks are turning both at the dump and at the shovel, it is hard to manage the trucks so that they will not interfere with each other. 17.5.285

Aggregate for Concrete Produced During Excavation

16. In building a sewage treatment plant in the Middle West the contractor installed a 1-cubic yard slackline cableway excavator with two movable towers which ran along the sides of the excavation. The towers first served to support the slackline cableway and later to support the tautline cableway while concreting was in progress. Since the slackline cableway was moved along the excavation as fast as the work progressed, it was not feasible to build the screening plant so that the cableway could discharge directly to it as in the usual installations. The material from the pit was handled very easily, however, by means of a movable hopper which received the load in the cableway bucket. This hopper moved on rails between the excavation and the head tower. Under the hopper was a narrow gage track, and small industrial cars received the sand and gravel from the hopper and carried it to the screening plant at one side of the construction site. The screened material was stored in large piles and was reclaimed later when the concrete mixing began. 17.3.141

Fill for Large Railroad Yard Handled by Slackline Cableway

17. A fill approximately 1,000 feet long by 330 feet wide was recently made by using a slackline cableway to excavate gravel from a nearby river. The contractor studied the situation and found that the long range excavating ability of the slackline cableway excavator combined with its economical conveying and its ability also to elevate from the river bed to the height necessary to make the fill, made the cableway the best machine for this work. A 1½-cubic yard 700-foot span machine with a 2-speed electric hoist was used. Since the cableway was moved along the bank of the river as the fill progressed, it was attached at the head end to a movable self-supporting steel tower 80 feet high which was mounted on skids. The two-speed electric cableway hoist was mounted in the base of the tower, while the operator sat in an elevated cab just above the center of the tower, giving him a full view of the whole operation. 17.4.233

Portable Tool House on Road Job

18. To keep all equipment in prime condition and to have supplies near at hand when needed, an Indiana contractor devised a portable tool house mounted on flat tired steel wheels and hauled by a supply truck. This tool house was always just ahead of the concreting operations. The tool house carried shovels, picks, pipe line materials, spare parts, hose, etc., and on the side a hand screed to use in emergency in case the machine finisher should break down. The truck carried a 400-gallon gasoline tank, an oil drum and barrels of steel center joints, dowels cut to 4-foot lengths, and barrels of chairs for supporting the side dowels, 6 inches from the side form and at the midpoint of the 9-inch slab. 17.5.300

Expeditious Drilling Procedure

19. During the construction of the Moffat Tunnel, the contractor developed an excellent drilling, loading and firing procedure which speeded work for his advantage.

When the broken rock at the face—or "muck" as it is usually called—was loaded into the cars by hand, the customary method of operation was to level off the top of the muck pile and have the machine men commence operations by erecting the drills on a cross-bar—and they were generally able to drill the upper holes before the shovelers began to dig the ground out from under their feet. The shovels used in the tunnel usually cleaned up the muck from a round of shots in from two to two and a half hours, and as the shortened period rendered it inadvisable to attempt drilling on the top of the muck pile, the face was therefore cleaned up before drilling commenced. It was found both expeditious and economical to lay the rails up to the face as soon as the mucking was completed, and the four rock drills used in the heading were then mounted on a heavy carriage which could be run directly up to the face. These drills were always kept on the carriage and their air and water pipes connected to a manifold on the car, so that to begin drilling it was only necessary to connect the main compressed-air and water pipes with the manifold and run out the jackscrews to hold the car in position, operations which usually took from fifteen to eighteen minutes. Under the system formerly employed the drills and the columns had to be carried back from the face by the men, far enough to be safe from flying rock, and in setting them up again they of course had to be brought back in the same manner, and by the time the columns were set up and the drills in place ready to run, the men were nearly tired out. Under the new system they began drilling perfectly fresh, and of course were able to work much more efficiently, a condition clearly proved by the reduced amount of drill repairs.

As the railroad heading and the pioneer tunnel were carried forward at approximately the same rate of progress, it was found desirable to synchronize the operations of drilling, loading, and firing with those of mucking and bringing the rails up to the face. Under this system, when the drillers were at work in the face of the pioneer tunnel the muckers were cleaning up the face of the railway heading, and as both operations were timed to be completed simultaneously, the machine men ran their drill carriage and the muckers their loading machine back to the nearest cross-cut and changed places. Under this system, even in the hardest rock, the machine men can readily drill, load, and fire two rounds in an eight-hour shift, one in each heading. Where conditions were favorable, eight rounds were often drilled in twenty-four hours. 16.2.90

A Section of
CONTRACTORS
AND
ENGINEERS MONTHLY
Devoted to
News of Consultants
in the
Civil Engineering Field

The Consulting Engineer

April, 1930

New York

Vol. I, No. 4

New Sewage Treatment Plant at Allentown, Pa.

Office of Metcalf & Eddy, Engineers, Boston, Mass.

IN December, 1929, the primary portion of a new plant, designed by METCALF & EDDY, was placed in operation to treat the sewage of Allentown, Pa., before its discharge into the Lehigh River. Although the plant will ultimately consist of racks, skimming-detritus tanks, Imhoff tanks, trickling filters, secondary sedimentation tanks and sludge-drying beds, with provision for disinfection of the effluent, the filters and secondary tanks have not yet been built. Bids for these two units of the plant are to be opened on April 15.

The plant is designed to serve a contributing population of 128,000 persons, which it is expected the city may have in 1935. The average rate of sewage flow for this population is estimated at 17.3 million gallons daily, and the maximum rate is expected to be about double the average. The capacity of the main sewer entering the plant is 59 m.g.d. The features of the plant are so arranged that duplicate features may be added so as to double the capacity when needed.

The sewage arriving at the treatment plant is first passed through bar racks, to keep large objects from reaching the centrifugal pumps by which the sewage is lifted into the skimming-detritus tanks. These tanks are of the Dorr pattern, and are two in number, each 30 feet in diameter and 21 feet deep. They serve two purposes: first, to remove floating solids and oil by skimming, and secondly, to remove grit and heavier solids by settling, pumping and screening. The tanks are designed to permit a 15-minute detention period on the basis of the estimated average flow in 1935. The floating matter is skimmed from the surface of each tank by means of two wooden booms. The heavier material settling to the bottom of the tank is pushed to a small sump at the center by means of scrapers and plows. From the sump the collected matter is pumped, together with a small portion of the liquid in the tank, to fine screens. The liquid which passes through the screens is conveyed, together with the main flow of sewage from the detritus tanks, to the Imhoff tanks.

(*Continued on page 89*)

Allentown Sewage Treatment Plant, Showing Detritus Tanks, Imhoff Tanks and Sludge-Drying Beds

The Consulting Engineer

Published by

Contractors and Engineers Monthly

443 Fourth Avenue, New York

EDGAR J. BUTTENHEIM, President
THEODORE REED KENDALL, Editor
MYRON MACLEOD, Advertising Manager

CHICAGO OFFICE, Daily News Plaza
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Engineer for Building Equipment Moves Offices

THE offices of H. W. SCHARF, consulting engineer of New York, have been moved to the Loew State Building, 1540 Broadway, from 120 West 42nd Street. This organization has been engaged in the design and planning of mechanical and electrical systems and equipment for commercial buildings, including the 1,200-foot Larkin Tower office building project. Mr. Scharf has been connected with the planning and construction of buildings and equipment, power plants and power distribution for large industries and public utilities, improvements in industrial plants, and valuations of large public utility properties. He was formerly with the New York Railways and later with the firms of Sanderson & Porter and McClellan & Junkersfeld. While with the latter concern part of his work was on the Cahokia power plant.

Consulting Briefs

Gilbert C. White Co., Durham, N. C., has reported that work now going on under its supervision includes additions to the water works at Concord, N. C.; the installation of paving, sanitary and storm sewers at Southern Pines, N. C.; paving, curb, gutter and sidewalks for Charlotte, N. C.; and has recently completed a paving program for Asheville, N. C. Members of this organization include Gilbert C. White, President; Preston P. Phillips, Chief Assistant and John W. Pumphrey, Field Engineer.

Philip S. Wickerham, 339 North McKean St., Butler, Penna., is now working on plans for a complete sewage disposal plant for Corry, Penna., including an Imhoff tank with special facilities for interchange of sludge within the tank, provisions for future collection of digestion gas and glass covered sludge drying beds.

Caven Engineering Co., 609-10 Gerke Bldg., Cincinnati, Ohio, have recently completed plans for grading, building layout and railroad sidings on a 10-acre tract for the new plant of the Hauser-Stander Tank Co., Cincinnati, Ohio, and are at present supervising the grading operations and the construction of the railroad sidings.

George A. Johnson, Consulting Engineer, 156 Nassau St., New York, N. Y., is at present preparing plans for two water works, one sewage works and three refuse collection and disposal systems, and is supervising the construction of a $1,000,000 sewerage and sewage disposal works in Norwalk, Conn. Mr. Johnson is also acting as expert witness in the Hackensack, N. J., Water Co., rate case. Rene M. Genthon, T. H. Winter and and Walter E. Malony have recently joined Mr. Johnson's staff.

George A. Johnson

The Luckey Miller Co., Inc., County Bldg., Fargo, N. D., has recently made some changes in personnel and the company is now composed of A. S. Miller, Deane B. Spalding and Robert W. Brownlee. This organization specializes in general private practice, in bridge and road construction and is now engaged on road and bridge plans for Cass County, N. D.

Elroy S. Smith, Civil-Consulting Engineer, 311-314 Herald Bldg., Augusta, Ga., is preparing plans for water and sewerage systems for Horse Creek Sanitary District, an appraisal of highway systems of Richmond County and is making a preliminary investigation for a large quarry development. He also prepared plans for and is now supervising the repairing and strengthening of the Augusta Levee System.

The Osborn Engineering Co., 7016 Euclid Ave., Cleveland, Ohio, has announced a reorganization of the company, effective during January, 1930.

The following officers have been appointed: President, P. P. Evans, formerly Vice President of the company; Vice President, E. H. Birney, formerly Vice President of the Peerless Drawn Steel Co. of Massillon, Ohio; Treasurer, T. T. Hubbard, Director of the company since 1912; and Secretary, Kenneth H. Osborn.

New Sewage Treatment Plant

(Continued from page 87)

The solid matters removed by the skimming-detritus tanks are disposed of by incineration.

There are six Imhoff tanks, each 75 feet x 66 feet in plan, with a maximum water depth of 33 feet 7 inches. The tanks are designed to furnish an average detention period of 2 hours, each one having a sedimentation compartment of 32,000 cubic feet water capacity. In the Imhoff tanks a large part of the suspended solids is settled out of the sewage, forming sludge in the lower part of the tanks. The sludge compartments are designed to store 6 months' production of sludge, each tank having a sludge capacity of 72,500 cubic feet. Chlorine solution may be added to the effluent from the Imhoff tanks before its discharge into the river.

Sludge is to be discharged from the Imhoff tanks to 68 sludge-drying beds, having an aggregate area of 2.25 acres. Each bed is 80 feet x 18 feet in plan, consisting of a layer of sand on top of graded gravel. The dried sludge is to be transported from the beds to a dump by cars running on a system of industrial tracks.

After completion of the contract which is soon to be awarded, the effluent from the Imhoff tanks will be discharged upon trickling filters. There will be about 5 acres of filters made of crushed stone ranging in size from 1 inch to 2½ inches, averaging 10 feet in depth. The settled sewage will be distributed over the surface of the filters by means of some 1,500 nozzles throwing a circular spray. After trickling down through the stone, the filtered sewage will receive secondary sedimentation in 4 tanks, each 70 feet in diameter and having a maximum water depth of 11.5 feet. The capacity of each tank will be 41,900 cubic feet, including space for sludge. The effluent from these tanks will be discharged into the river, and the sludge pumped to the lower compartment of the Imhoff tanks for digestion.

The accompanying photograph shows the plant as it now is, with Imhoff tanks in the center and sludge beds at the left. The trickling filters will be at the right of the Imhoff tanks. The plant is located on an island, and it will be noted that a dike has been provided to prevent flooding at high stages of the river.

The construction of the plant has been under the supervision of Metcalf & Eddy with John P. Wentworth in immediate charge, and under the direction of Jas. W. Holman, Supt. Department of Streets and Public Improvements, and E. W. Meckley, City Engineer.

A Correction

AN error appeared in the article entitled "New System of Concrete Tank Construction Used in Midwest" published in our March issue on page 101 in the third line from the bottom. Referring to the efficacy of an iron removal plant built for the Village of Osseo, Wis., the following statement was made, "The iron content is by this process reduced by 0.2 p.p.m. and the manganese is entirely eliminated." Mr. Milinowski of Druar & Milinowski, consulting engineers of St. Paul, Minn., informs us that this should correctly read, "The iron content is by this process reduced to 0.2 p.p.m.", etc., as it would hardly pay to install an iron removal plant for the purpose of reducing an original iron content of 4 p.p.m. by 0.2 p.p.m.

B. M. Hall's Sons Continue Practice

THE consulting practice of B. M. HALL & SONS, Civil and Mining Engineers, Atlanta, Ga., is being carried on by B. M. Hall, Jr., and Warren E. Hall. This firm was established in 1889 by Benjamin M. Hall who died last November. B. M. Hall, Jr., has been an active member of the firm since 1916 with the exception of two years of service in the United States Army. Warren E. Hall has served as District Engineer, U. S. Geological Survey, Water Resources Branch, spent 18 months as an Army Engineer, has engaged in private engineering work in North Carolina and Georgia and has been actively connected with B. M. Hall & Sons since 1926.

This firm has served since 1922 as consulting engineers for the city of West Point, Ga., and others in preparing plans for a combined flood control and water power project on the Chattahoochee River. Besides producing more than 100,000,000 kilowatt hours per year, the proposed dam is designed to retard the flood flows and prevent a repetition of the disastrous floods which have visited the city of West Point in past years.

B. M. Hall & Sons last year finished the construction of a 120,000,000-gallon storage reservoir, filter plant and gravity water supply system for the Berry Schools, Rome, Ga., and recently completed for Governor Franklin D. Roosevelt and associates a water supply and fire protection system for the Georgia Warm Springs Foundation.

At present the members of the firm are the hydraulic engineers for the Tate Mountain Estates, Inc., Tate, Ga., and are engaged in the construction of an earth dam in the mountains of Georgia which will create a lake at an elevation of 2,800 feet above sea level. Earth from borrow pits is excavated by steam shovel, hauled by tractors, trailers and motor trucks to the dam where it is spread into thin layers and rolled. M. R. Woodall Co., Inc., Atlanta, Ga., is the contractor and Warren E. Hall is Resident Hydraulic Engineer.

Many Projects Under Way in Western Office of Kansas City Engineers

PLANS for a number of projects are being prepared and other projects are being supervised by the Western office, located at Western Pacific Bldg., Los Angeles, Calif., of the BURNS-MCDONNELL-SMITH ENGINEERING Co., Kansas City, Mo., in addition to the work being executed from the main office. Among the plans which are now being prepared are a report on waterworks improvement for Fullerton, Calif.; a report on sewage and garbage disposal for Palo Alto, Calif., plans for sewage disposal and an outfall sewer for Stanford University; a sewer system for the Capistrano Beach Sanitary District, Calif., and a water filtration plant for Weiser, Idaho.

The company is retained as consulting engineers for the waterworks improvements at Glendale, Burbank and Whittier, Calif. The construction of a sanitary sewage treatment plant and storm sewers to take care of the sewage and cannery wastes at Salinas, Calif., is under the supervision of the Burns-McDonell-Smith Engineering Co., as well as the reservoir repairs, Burbank, Calif., and the construction of a waterworks system at Downey, Calif.

Additions to Staff of H. A. Davis

THE firm of H. A. DAVIS, consulting engineers, 1226 Main St., Crete, Neb., and 728 Main St., Osage, Iowa, has recently added Leon F. Maca to the staff at the Osage, Iowa, office, and H. W. Gausman and Charles Krache to the Crete, Neb., staff. This organization is now working on plans for a paving project at Osage, Iowa, and is supervising construction on pavement work at Oleans, Neb. They are also giving expert testimony in a case involving the drainage of over-irrigated lands at Cozad, Neb.

H. A. Davis

Flood Control Work and Storm Sewers

WORK under the personal supervision of H. R. F. HELLAND in Austin, Texas, includes a $200,000 storm sewer project, sanitary sewer work, which will cost approximately $200,000, bridges to cost about $75,000, and a $1,000,000 paving project. Mr. Helland is also associated with HAWLEY & FREESE, 303 Frost Bank Bldg., San Antonio, Texas, who are supervising a flood control project at San Antonio, which it is estimated will cost about $200,000, and a sewage treatment plant in the same city to cost approximately $1,000,000.

Work in the San Antonio office includes plans and reports on a $70,000 storm sewer program for Cuero, Texas, and a $125,000 water works and sewer project at Refugio, Texas. Various other jobs are being worked on out of the Fort Worth, Texas, office of Hawley & Freese.

Water, Sewerage and Light Projects Planned by Rollins

PLANS are now under way in the office of the W. B. ROLLINS & Co., 339 Railway Exchange Bldg., Kansas City, Mo., for electric light and sewerage projects at Concordia, Mo., improvements to the electric light plant at Unionville, Mo., a water works plant and sanitary sewerage system for Belton, Mo., and a water works system for Platte City, Mo.

Work going on at present under the supervision of Rollins engineers includes water works and sanitary sewerage systems for the cities of Wellsville and Norborne, Mo., a water works system and electric light plant for Harrisonville, Mo., and an electric light plant at Galt, Mo.

Harvey & Kirchoffer Form Partnership

ON October 1, 1929, W. G. Kirchoffer, a sanitary and hydraulic engineer of Madison, Wis., and B. C. Harvey formed a partnership under the name of HARVEY AND KIRCHOFFER, with offices at Rural and Prospect Streets, Rockford, Ill. The new firm will specialize in municipal work such as sewage disposal, water supply, water filtration, sewerage, paving, etc.

After spending 12 years with the City Engineering Department of Rockford, Ill., for 6 years of which he was City Engineer, Mr. Harvey left the city's employ and spent five months with the Mid-West Paving Brick Association as Paving Engineer. He then opened a partnership engineering office known as the Rockford Municipal Engineering Co., and in this capacity designed a water system for the villages of Kirkland and Durand, Ill., remodeled the water pumping station at Byron, Ill., designed a sewer improvement and paving improvement for Sycamore, Ill., and a paving improvement for the business section of Dakota, Ill. The Rockford Municipal Engineering Co. dissolved on September 25, 1929.

Many Additions to Staff of C. E. Smith & Co.

THE addition of several engineers, including M. H. Doyne, S. B. May, M. C. Beck, Robert M. Boyles, Milton M. Kinsey, F. R. Nohl and R. L. Saettele, has recently been made to the firm of C. E. SMITH & Co, consulting engineers, 1752 Railway Exchange Bldg., St. Louis, Mo.

This organization now has studies under way for the downtown Union Station at New Orleans, La., for the Louisiana Public Service Commission, as well as studies for the elimination of railroad grade crossings for Laurel, Miss., and city planning and zoning studies for Monroe, La. They are also engaged on the design and supervision of construction of the railroad approach to the St. Louis Municipal Bridge, the design for an elevated railroad approach to the McKinley Bridge at St. Louis; and are preparing a report for the municipal water, light and power plant at Kirksville, Mo. In addition, they are supervising the construction of water and sewer installations at Chaffee, Mo.

The company represents the city of St. Louis in litigation on street railway, electric light, power, gas and telephone rate cases, as well as in condemnation proceedings for the acquisition of private property for public improvements. They also represent numerous railroads in valuation matters before the Interstate Commerce Commission.

Water Supply Specialist

PLANS and supervision of construction on several public water supply projects are now engaging the attention of J. R. PENNINGTON, consulting engineer, Carson City, Nev. These include water supplies for Reno, Nev., and Lovelock, Nev., as well as a water supply for the State Orphans Home at Carson City, Nev., and a similar supply for the Western Pacific Railroad Co., Jungo, Nev.

R. L. Pennington, who has specialized in the development of underground water supplies, has recently joined the staff of this organization. The accompanying photograph shows J. R. Pennington during his recent investigations in the cane fields of Porto Rico.

J. R. Pennington

Roy S. MacElwee Honored

FOR services in connection with the recent port and ship canal developments in Belgium, His Majesty Albert I, King of Belgium, conferred at the New Year Day promotions, the Order of Leopold II, grade of Officer, upon Dr. Roy S. MacElwee. Similar honors which have previously been bestowed upon Dr. MacElwee are Polonia Restituta, grade of Officer, from Poland; Commander, Crown of Rumania; Chevalier, Crown of Italy. Dr. MacElwee was director of the Bureau of Foreign and Domestic Commerce in the Wilson administration and for the past several years has been Commissioner of Port Development for Charleston, S. C.

Dr. MacElwee is a member of the newly established firm of MacElwee & Crandall, Inc., Industrial and Civil Engineers, with the head office at Cambridge, Mass. This firm specializes as consulting, designing and supervising engineers in port development, terminal facilities, city planning, airports, waterfront improvements, industrial surveys for cities and plant locations. J. Stuart Crandall is the other member of the firm.

Variety of Work Carried on by Oklahoma Engineer

INCLUDED in the projects for which plans or reports are now being prepared by PEARL A. LITTLE, Chickasha, Okla., are two 120-foot steel truss spans in Harmon County, two drainage districts on Wild Horse Creek, Garvin County, 10 miles of hard surface highway from Amber to Chickasha and finishing 23 miles of gravel highway southeast of Chickasha. The latter project is being constructed under Mr. Little's supervision, as are I-beam bridges in Garvin County, concrete culverts and concrete paved crossing in Grady County.

Mr. Little has recently acted as expert witness in several litigations including the cases of Beauchamp vs. A. T. & S. F. on a drainage question, Beauchamp vs. C. R. I. & P. for damage, Hunter vs. St. L. & S. F. on drainage and Moon vs. C. R. I. & P. for damage.

Elmer N. Fields and Paul A. Little have recently joined the staff. Mr. Fields is located in Pauls Valley and Mr. Little in Chickasha.

Plans for Water and Sewerage Systems in Texas

A REPORT from H. L. THACKWELL, Consulting Engineer, 610 South Bolton Street, Jacksonville, Texas, states that he is engaged in preparing reports and plans for water and sewerage systems at Fort Neches and Dayton, Tex., a sewage disposal plant at Lufkin, Texas; street paving and sewers at Jacksonville, Texas; a sewage disposal plant at Tyler, Texas; waterworks at Alto, Texas, and appraisals on electric, water and sewer properties for Livingston, Texas. The Jacksonville, Lufkin and Dayton projects are now being constructed under Mr. Thackwell's supervision. He also acted as expert witness in litigation for the sewage disposal and treating works for Lufkin, Texas.

Recent additions to Mr. Thackwell's staff include R. F. Gray, Principle Assistant Engineer; T. E. Lundy, Assistant Engineer, Gordon W. Dabney and C. L. Canon, Resident Engineers.

Survey for Minnehaha Creek Development in Minnesota

A SURVEY for the development of Minnehaha Creek Valley from Lake Minnetonka to Minneapolis, Minn., is now being prepared by SVEN A. NORLING, Hydraulic Engineer, 343 Gateway Bldg., Minneapolis, Minn. This development includes the construction of a series of upper stream dams, with artificial lakes above the dams, constituting about 1,000 acres.

The Winona flood control and lake improvement and various reclamation projects in Minnesota are being carried on under Mr. Norling's supervision. He has also acted as expert witness in the Great Lakes Water Level case recently settled by the United States Supreme Court.

Paving Reports for Iowa Cities

REPORTS on paving for Council Bluffs, Des Moines, Creston, Cedar Rapids, Marshalltown, Charles City and Keokuk, Iowa, are among the work now under way in the PATZIG TESTING LABORATORIES, 210 11th St., Des Moines, Iowa.

Monroe L. Patzig

This organization has just completed supervising construction on a $200,000 paving project in Council Bluffs, and a $300,000 paving project in Des Moines, Iowa. In addition, materials for the construction of the New Kirkwood Hotel at Des Moines, the Montgomery-Ward Bldg. in the same city, and the new Iowa State University Stadium at Iowa City were under the supervision of this firm.

They have been called upon for expert testimony in the case of A. Emmert, Contractor, vs. the City of Grinnell, Iowa, involving the construction of a disposal plant, and in the litigation between the City of Mitchell, S. D., and Hartford et al., concerning a paving project. They are now engaged on several interesting research problems.

Water Supply, Sewerage Systems and City Planning

THE consulting firm of F. L. KNIGHT & SONS, Suite 8, Crawford Bldg., 115 S. Court St., Crown Point, Ind., specializes in water supply projects, sanitary sewerage systems and city planning and parks. They are at present working on plans for a water works system for the town of St. John, Ind.; a storm drainage system for the city of Crown Point, Ind.; and sanitary sewerage systems for the towns of Lowell, Schererville, and Griffith, Ind. Lawrence L. Knight, Chief Engineer of the organization, reports that no construction has been under way during the winter but they expect to begin work on these projects some time during this spring. The firm is frequently called upon to act as expert witness in cases involving land surveys, storm and sanitary sewerage systems and water supply systems.

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The Editor Comments —

The Resident Engineer Gets a Jolt

When I visited the North Beach airport while it was under construction, J. W. Adams, Resident Engineer for New York Air Terminals, Inc., told me of a startling experience he had when he first was going over the ground where demolition of the old structures began prior to sluicing operations.

Late one afternoon he entered the old photograph studio and poked his way through the backdrops to find out just how the structure was built and how best to start tearing it down. Suddenly in the dim light, he realized that there was the body of a woman lying before him. His first thought was, "What a fine place for a murder!" but upon examining the body, he found it was a dummy that had been used in the studio years ago for amorous poses of male customers.

A Big Foundation Job

Last week I covered the foundation work on the new Empire State, a great office building that will rise on the site of the old Waldorf at 34th Street and Fifth Avenue, New York. To the layman the job is just one big board fence with four barn doors set up and through which trucks slide down into the hole or emerge with loads of stone pried loose with shots of dynamite of just the right size.

Why Are the Windows Fixed Up So?

That question has been probably the most frequent in the vicinity of the Empire State job for the last three months. The cause of the question is not novel. It is only the wire and wood frame devices erected by the contractor to damp the vibrations from the blasting. The buildings along Fifth Avenue and both 34th and 33rd Streets are filled with huge expanses of plate glass windows on both the first and second floors. What a whale of a crash there would be if there were an excessive blast and the costly windows were not protected!

Rarin' to Go

Work is opening up in this section of the country along the road construction lines, and as soon as this issue is off the press I am starting on my first trip of the season, a tour of New Jersey where there is a lot of new road going in, a bunch of interesting grade separations and some plant layouts and grading organizations that will give you something to think about. Yes, I'm rarin' to go, as it means the beginning of a series of trips lasting well into October that will cover over 11,000 miles. Last year I told you I was going on a 6,000-mile trip, and hit 7,316 for good measure!

This summer I'm going back into Canada. I like the way they handle jobs up there and we can all use a lot of their ideas. In May I shall be in the South and Middle West and then wind-up in New England in September. If you have a job in any of these territories let me know and I shall try to drop in. At the Road Show Daniel D'Onfro invited me to look him up at Watertown, N. Y. Last year he rebuilt the Mohawk Trail in Northwestern Massachusetts. (See our January, 1930, issue.)

The Future of Diesels on Construction Equipment

There have been so many inquiries about the extent to which diesel engines are used today on construction equipment that we have made a survey that covers the field pretty thoroughly. The result will appear in CONTRACTORS AND ENGINEERS MONTHLY in May and I know you will be interested in the unanimity of opinion as to the reason for so few diesels now, why they won't jump in as rapidly as gas engines did, and just what must happen before they become more general.

Ready-Mixed Concrete

Last month I discussed at some length the impressions which I had received in talking over ready-mixed concrete and mixed-in-transit concrete with various operators. In the responses which I have received the greater number have been in entire accord with my discussion, but there is one outstanding objection which has been raised which is worthy of publication. It comes from Lion Gardiner, Vice President, Highway Truck Mixer Co., and reads as follows:

"I note your comment in the March issue relative to ready-mixed concrete. Our company, a subsidiary of Lakewood Engineering Co., is putting out a line of truck mixers which are suitable for mixing in transit or as agitators in handling central-mixed concrete.

"To date a large majority of the mixers sold have been for the purpose of mixing in transit. A statement such as you print of a successful operator who says 'He has the best set of drivers in the country and that he wouldn't allow them to mix a batch on the road,' is utterly preposterous, when we consider the fact that probably today there are a minimum of 300 trucks operating in this country, delivering good concrete mixed in transit by the truck driver.

"The actual mixing is not in the hands of a truck operator any more than the mixing in a paving mixer is in the hands of a mixer operator. All he must do is to throw a lever and the manufacturer's design does the rest and when the tests of concrete so delivered show above the average strength, it is indicative of the fact that the manufacturer has done his duty.

"It is quite an economic study to determine definitely where the central-mixed plant and where the transit mixer finds its place in the picture. It is entirely too much of a subject to attempt to cover by letter, but I am inclined to suggest that a statement such as you printed may give an entirely wrong impression among readers."

We greatly appreciate Mr. Gardiner's discussion and hope that it will cause our readers to give even more thought to this important new field of endeavor in the manufacture and transport of concrete.

Theodore Reed Kendall

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

How the Contractor Is Affected by Generally Recognized Customs in His Industry

"I will lay this line of pipe for you at 45 cents per foot," said a contractor.

"You're on," replied the owner.

The pipe was laid, but a lawsuit resulted from the failure of the parties to agree upon whether it had been up to the contractor or the owner to *haul* the pipe.

The contractor's attorney said to the court: "There is a custom in this community under which it is generally understood that where nothing is said in a contract of this kind about hauling the material, the owner must stand the expense."

To this the California District Court of Appeal, Third District, replied in so many words (Latta vs. Da Roza, 280 Pac. 711, decided September 17, 1929):

"Those who are engaged in a certain trade or calling are presumed to know and to be bound by generally known local customs applying to that trade or industry. This is true regardless of whether a *member of the trade or industry* actually knows the custom or not.

"But in the case of outsiders—for instance, an owner who is not engaged in the building or construction business as a calling, and who has only made one or a few contracts with a contractor—they are not bound by a custom among contractors unless they knew of the custom when they entered into the particular contract, or ought to have known of it. And the custom must have been very generally known by the public before it will be fair to say that the particular owner ought to have known of it. Here, there is nothing to show that this land owner knew of this custom. Therefore, he is not bound by the custom."

An Interesting Interest Point

"I know that you will need considerable money to pay for materials and labor for stone work on this building," said a general contractor to a sub, "and I will advance you $10,000. But there is this string on the advance: if the contract should be cancelled, you are immediately to pay me back the unearned part of this advance. You can keep out of the ten "grand" enough to cover what is due you up to the date of cancellation, but I am to have the balance back at once."

The contract was cancelled but the sub had formed an attachment for the $10,000 and did not like to give any part of it back. Furthermore, he insisted that even if he had unduly clung to part of the sum he ought not to have to pay any interest for the time that he withheld that part, because the contract did not say anything about interest.

The parties could not adjust the controversy to mutual satisfaction and indulged themselves in the luxury of a lawsuit, which was heard in two courts in Texas. The general contractor won out on the ground that when the contract was cancelled, the sub was obligated to immediately return the unearned balance of the advance, and that he must pay interest at the legal rate for the full time that he thereafter hung onto the amount that was repayable to the general contractor. (American Construction Co. vs. Lassig, 20 S. W. 2d, 797, finally disposed of July 17, 1929.)

A Partnership Phase

When two or more contractors are about to form a partnership they can do no more sensible thing than to carefully formulate an agreement designed to minimize the chance of any future controversy. The agreement should, of course, be reduced to writing and signed.

One of the most important points to be agreed upon is how much time each member is to devote to the firm enterprise and how much salary, if any, he is to receive. This is specially true when there is inequality in contributions of capital or services to the business.

Contrary to what commonly may be supposed, the law does not say that because one partner contributes more of his time than his associate he is to receive pay for the extra time. In fact, one of them may give all his time to the business and the other no time whatever and yet the former will not be entitled to special compensation on that account, unless there is a special agreement so entitling him or unless the circumstances are such that it fairly may be inferred that the parties mutually understood that special compensation would be allowed.

It is well to provide in the agreement whether salaries agreed upon shall be paid in case of protracted absences due to illness or other cause, and whether the associate or associates who remain on the job are to receive extra pay for extra work thrust upon them by such absences. It has been held by the courts that a partner's absence from business on account of illness does not give his associate a claim for special compensation in the absence of agreement therefor.

Insuring Corporate Officers' Lives

Even though neither the articles of incorporation nor the by-laws of a construction corporation may expressly authorize the carrying of insurance on the lives of the company's chief officers or managers, the law recognizes the validity of such insurance. The reasoning under which it is held that a corporation has an insurable interest was thus stated by the Louisiana Supreme Court in the recent case of Harris vs. H. C. Talton Wholesale Grocery Co., 123 Southern Reporter, 480:

"Talton and McCrary were not only the chief stockholders of the corporation, but they were its chief officers and sole managers. Upon them depended the success of the business. Their ability to conduct successfully the affairs of the corporation was one of its assets, and probably, as is sometimes the case in corporations like this, its main asset. If either had died, it would necessarily have suffered serious loss. The corporation, therefore, had an insurable interest in each of them, and under its powers could do any act 'in furtherance of its interest when not prohibited by law.' The act of taking the insurance is not prohibited by law, and we think was in furtherance of its interest, as much so as the taking of fire insurance on its real and personal property. The corporation had no by-laws and there is no specific authority in the charter for taking fire insurance on its property. But it would hardly be contended, we think, that the corporation could not under its implied powers bind itself for the premiums on a fire insurance policy. The taking of such insurance is incidental and necessary and in furtherance of its interest."

An Important Decision on Measure of Damages for Defective Materials

"We asked for building blocks and you delivered cement coated briquettes. We want damages." That, in substance, is what owners of a house said to a Tennessee tile company. The company denied that the blocks were combustible or defective and a lawsuit resulted. The Tennessee Supreme Court decided in favor of the purchasers of the blocks. (Tennessee Roofing & Tile Co. vs. Ely, 21 S. W. 2d, 398. November 16, 1929.)

The important phase of the case turned upon the legal effect of the buyers having continued to use the blocks after discovering that there was some coal in them.

When the company sued to recover a balance due on the contract price, the buyers counterclaimed for damages for breach of a warranty that the blocks, which were made of cement and the refuse of coke ovens, were fireproof.

After 300 of the blocks had been placed in walls it was discovered, through breakage of one, that there was coal in it. But use of the material continued under assurance by the company that the blocks were all right. When the building was practically completed, it was discovered that nearly half of the material in the blocks was combustible.

The Tennessee Court of Appeals decided that the buyers should have discovered the condition of the blocks earlier and that the quality of the blocks was not materially affected by such coal as was in them.

But, on further appeal, the Supreme Court decided that the defective condition was not so patent that the buyers could not rely upon the assurance given by the seller.

As to the measure of damages, the Supreme Court said that, although, ordinarily, the measure of damages for defects in goods sold is the difference in the value of the goods at the time of sale in their actual condition and in the better condition required by the contract, the case came within the exception to this general rule, allowing greater damages under special circumstances directly causing them. The court said:

"The fact that the blocks were sold to Ely for the purpose of use in the walls of his proposed dwelling house, and that they had become an integral part of the building before knowledge of the breach of warranty was acquired by the buyers, constitute 'special circumstances showing proximate damages in a greater amount' than would follow from the application of" the general rule.

The court concluded that the proper measure of damages in this case is "the difference between the sale or market value of the building as constructed and its sale or market value if the blocks used in its construction had been the fireproof blocks as warranted."

It would seem that the same measure of damage would apply against a contractor using defective materials in construction under similar circumstances.

City Construction Awards

A Wisconsin city called for bids to construct a pier, but all bids were rejected as being too high. Now the city plans to furnish the materials itself and build the pier by day labor, hiring the highest bidder to superintend the work.

The lowest bidder asks whether or not he can compel the city council to call for new bids on the labor or on the employment for superintendence.

It would take a more careful search through the Wisconsin statutes relating to city affairs to answer this question definitely than we can undertake to give. However, it is altogether probable that there is nothing in the Wisconsin statutes to prevent the city from pursuing the contemplated course. Ordinarily, cities have a right to construct improvements of this character by day labor, especially when it is clear that a saving or better work will result.

In the employment of a superintendent to supervise contract work, a city is never required to award the employment on competitive bids.

When a Contract Is Usurious

"The Bible and the laws of Louisiana condemn usury," said a buyer of building supplies to the seller. "Therefore, I will pay you the principal amount of your bill, but you will 'have to whistle' for that extra 10 per cent that our contract calls for."

The seller's attorneys told him that the usury law did not apply and that the contract was an enforceable contract, and the controversy was checked up to the Louisiana Court of Appeal.

The bone of contention in the litigation was a clause of the contract reading: "7 per cent discount will be allowed if paid within ten days from date of delivery; 5 per cent if paid by the 15th of the month following; net to the last day of the month when, if not paid, 10 per cent will be added to the above price."

In an opinion filed November 18, 1929, the Court of Appeal decided that the clause for the added 10 per cent was usurious and therefore void. (Dendinger, Inc. vs. Emuy & Eichhorn, 124 So. 604.)

The court declared that a seller of goods or other property may have two prices—one a cash price and one a credit price—regardless of the difference in amount, and yet the credit price cannot be regarded as usurious. But that was not the fact in this case. On the contrary, the seller had one price, $1,775.38. If the buyer failed to pay it by a certain time he was to pay 10 per cent more. Plainly, that was an exaction of interest on a deferred payment in excess of the rate allowed by law.

Contractor Without Right to Grant Use of Highway Under Construction

"We are building a state highway over in Vermont," said a road building firm, "but have no convenient route over which to haul stone unless you permit us to use that piece of road you are constructing in Massachusetts. If you will let us use it, we will pay you 15 cents for every ton hauled over it."

"That is all right," replied a Massachusetts construction company, "provided you will also make good any damage done to the road on account of your use of it."

The Vermont contractors agreed to this condition and hauled more than 4,000 tons over the piece of road in question. They paid one item covering injury to the road, but refused to pay an additional item for damage or anything for use of the road. The Massachusetts company then sued to recover, but lost the suit, on the ground that the contract was invalid as being against public policy. In disposing of the case, the Massachusetts Supreme Judicial Court said in the case of New Haven Road Construction Co. vs. Long, 168 N. E. 161, decided October 5, 1929:

"By agreeing to permit the defendants to haul stones over a section of a highway into Vermont it violated the express term of its contract requiring that the road be closed to through traffic, and exceeded its authority. . . . Upon the facts it would be against public policy to permit the plaintiff to collect money from the defendant for their use of the highway as travelers. . . .

"The plaintiff contends that even if the part of the contract relating to a payment for the use of the highway is void the remaining part relating to the payment for damage done by the defendants in going over the way should be upheld. . . . The damage was caused by a permissive use of the highway which the plaintiff was not authorized to grant.

"There was evidence that the hauling of the stone delayed the work, and this result might be assumed as almost inevitable without evidence, notwithstanding testimony to the contrary, especially when it appeared that damage to the part of the road under construction had been caused and paid for. It is not in the public interest that public works should be delayed. For reasons which have sufficiently appeared, no part of the contract is enforceable, and the order directing a verdict for the defendants was right."

Construction Industry News

Continental Motors Corp., Detroit and Muskegon, Mich., has announced the appointment of Louis J. Kanitz as General Sales Manager. Mr. Kanitz joined the organization in February, 1920, and for the past four years has been in charge of the Industrial Engine Division of the company.

The Heltzel Steel Form & Iron Co., Warren, Ohio, has announced the appointment of B. M. Clark as Manager of Sales to succeed W. J. Savage who recently resigned. Mr. Clark has been Assistant Manager of Sales for Heltzel for several years and is familiar with the equipment problems of concrete contractors.

Link-Belt Co., 300 W. Pershing Road, Chicago, Ill., has announced the appointment of the Idaho Equipment Co., 118 Main St., Boise, Idaho, as its agent, handling the line of Link-Belt shovels, crane and draglines.

Independent Pneumatic Tool Co., Chicago, Ill., recently elected Frank B. Hamerly, Aurora, Ill., to the position of Vice President in charge of Manufacturing.

The Asphalt Institute, New York, newly organized to succeed the Asphalt Association, has elected the following officers: Leroy M. Law, St. Louis, Mo., President; W. H. Kershaw, New York, and C. W. Bayliss, Philadelphia, Pa., Vice Presidents; B. L. Boye, New York, Secretary; and Fisher Jones, New York, Treasurer. J. S. Helm, New York, is Chairman of the Executive Committee and J. E. Pennybacker, also of New York, is Managing Director.

The Institute is moving to new and larger quarters in the Crystal Building, 250 East 43rd St., New York, where the offices and a new and larger laboratory, with F. C. Field, Assistant Chemical Engineer in charge, will be located.

Chicago Pneumatic Tool Co., New York, has announced the opening of the following new branch offices: Perrine Bldg., Oklahoma City, Okla.; 327 Philcade Bldg., Tulsa, Okla.; and Merchants & Manufacturers Bldg., Houston, Texas.

Trackson Co., Milwaukee, Wis., recently appointed the following new distributors to handle Trackson tractor equipment for McCormick-Deering tractors: Concrete Machinery & Supply Co., 777 E. Merrill Ave., Los Angeles, Calif., for the Los Angeles territory; Highway Equipment Co., 919 First National Bldg., Columbus, Ohio, for the Columbus territory; Industrial Tractor & Equipment Co., 2702 Spring Grove Ave., Cincinnati, Ohio, for the Cincinnati territory; Fred D. Marshall Co., Columbia, S. C., for South Carolina; H. O. Penn Machinery Co., 140th St. & East River, New York City, for the New York City territory, and Raleigh Road Machinery Co., Raleigh, N. C., for North Carolina.

Bay City Shovels, Inc., Bay City, Mich., has announced the appointment of H. H. Cox & Co., Seattle, Wash., as the Bay City distributor for western Washington. Other recently appointed distributors include Central Ohio Equipment Co., Springfield, Ohio; Industrial Tractor & Equipment Co., Cincinnati, Ohio and O. D. Schneidler, Fort Wayne, Ind.

Universal Atlas Cement Co., 208 South LaSalle St., Chicago, Ill., has announced the appointment of Richard B. Hynes as Secretary of the company. Mr. Hynes was formerly Assistant Secretary and Assistant Treasurer of the Atlas Portland Cement Co. Another recent appointment is that of O. H. D. Rohwer as Assistant General Sales Manager in addition to A. C. Cronkrite who is continuing as Assistant General Sales Manager. N. A. Kelly, previously Sales Manager in New York of the Universal Portland Cement Co. is appointed to the same position in the new organization. A. O. Stark, appointed Assistant Sales Manager at New York for the Universal Atlas Co., was connected in a sales capacity with the former Atlas Co. for more than 20 years. William A. McIntyre, for 11 years a sales executive for the former Atlas Co., has been appointed to direct the sales forces working out of Philadelphia for the new organization.

Truscon Steel Co., Youngstown, Ohio, has announced the appointment of Oscar W. Loew as a Vice President of the company. Mr. Loew has been Director of Advertising and Sales Promotion of Truscon for the past six years.

William J. Savage, formerly Vice President and Manager of Sales of the Heltzel Steel Form & Iron Co., Warren, Ohio, resigned that position on March 15, to become Assistant to the President and Manager of Sales of the Brown Clutch Co., Sandusky, Ohio.

Portland Cement Association, Chicago, Ill., has announced the recent appointment of William G. Hudson as District Engineer in charge of Association work in the states of Louisiana and Mississippi with offices in the Hibernia Bank Bldg., New Orleans, La. Mr. Hudson has been a member of the field staff of the New Orleans office since 1923.

Gardner-Denver Co., Denver, Colo., has announced the transfer of B. Van Dyke, of the Quincy, Ill., sales division, to the New York Office of the company. Hendrick Stolk, recently of Stoksvis & Zonen of Holland, has been transferred to St. Louis from the Quincy plant where he has completed a sales study course.

Sixth Annual Open Air Road Show in New England

THE Sixth Annual Open Air All New England Road Machinery and Material Show is to be held on Tuesday, Wednesday and Thursday, May 6, 7 and 8, 1930, under the direction of the Massachusetts Highway Association at D Street, South Boston, Mass. Complete information regarding exhibit space may be secured from J. M. McCarthy, Secretary, Massachusetts Highway Association, Room 318, State House, Boston, Mass.

BELL TELEPHONE CONDUIT WORK IN ST. CHARLES, MO.

A Jaeger Speed King mixer with loader chute and centrifugal pump in use by the Graner Contracting Co., of St. Louis, contractors on the job. Equipment was furnished by the Geo. F. Smith Co., also of St. Louis

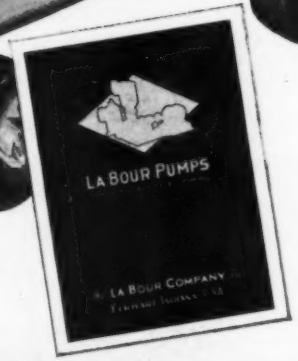
- - - months of *constant running* with *no* repair expense

--- and that's typical of LaBour Pump performance! Here you see a LaBour self-priming installation doing extra duty for the Marcus Contracting Company, New York, N. Y., on the Nassau Street subway job. This one pump lifts both air and water from two sumps ten feet below the level. And it has continued to do this for months with practically no attention, and with no repair expense. This, of course, is characteristic of all LaBour Pumps.

The LaBour self-priming feature, found on no other pump, does away with all check and foot valves and enables one pump to handle both air and water. Ample impeller clearances -- the impeller is the only moving part -- permit dirty water to pass readily through the pump without hazard.

Wherever water must be moved LaBour self-priming pumps can be depended upon to pitch right in and keep on pumping whether the inflow is continuous or intermittent. You can obtain LaBour Pumps in a variety of capacities for either portable or stationary installations.

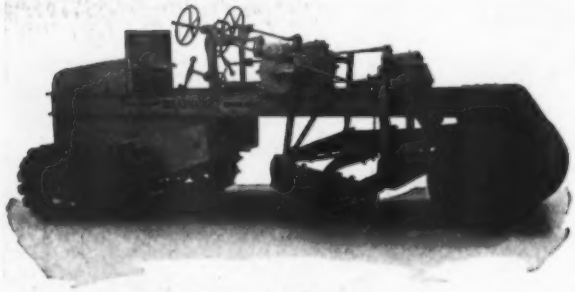
THE LABOUR CO., INC.
ELKHART, INDIANA



Write for Bulletin

LA BOUR PUMPS

NEVER LAY DOWN ON THE JOB



Good Roads Dreadnaught Power Grader

A New Heavy Duty Power Grader

A NEW heavy duty power grader has been developed and placed on the market by the Good Roads Machinery Co., Kennett Square, Pa. This new Good Roads Dreadnaught is built to withstand the extreme punishment that power graders are subject to on new construction or heavy maintenance road work.

The grader is powered with a Model S-12 Red Seal Continental motor which is governed at 1,400 rpm at which speed it will develop full 45 horsepower. The motor is securely installed in the main frame of the machine at the rear with three-point suspension. It is equipped with air cleaner, fan, built-in governor, starting motor with generator and distributor, gear-type oil pump, centrifugal water pump and large tubular radiator. A large capacity gasoline tank is provided. The motor is completely housed, the housing doors being readily removable on either side to give easy access to the motor. Convenient vent doors are provided for extra ventilation.

The transmission is a Brown-Lipe heavy duty selective type, giving four speeds forward and one reverse. An 8¼-inch brake drum is mounted on the rear of the transmission, which is connected with the differential by a Pick universal joint, connecting the transmission and differential and thus insuring equal distribution of braking power.

The differential is a Brown-Lipe-Chapin unit housed in a banjo-type steel casing and rigidly secured to the grader side frames. The drive axles are of heat-treated alloy steel and are supported at their outer ends by Timken tapered roller bearings. These drive axles take the final drive sprockets.

The final drive consists of two heavy roller chains running on machine-cut sprockets. Adjustment is provided so that the drive chain on either side can be taken up independently.

The main frame is of straight construction, with heavy 10-inch ship channels. A rear motor housing of heavy steel plates is rigidly tied to the main frame channels and ample ¾-inch rivets secure the whole frame and motor housing construction. The front end construction is of heavy steel plates, welded and riveted. The extra weight gives the machine the proper balance to prevent the front end from skidding into the gutter or bank when hard ditching or slope work is being done.

The extra heavy drawbar is secured to the pull pin in front by a universal joint arrangement and the large diameter circle is of heavy flanged boiler plate steel, the large blade hangers being riveted to the circle flanges. The moldboard is of ⅝-inch thick high carbon steel, either 10 or 12 feet long, as specified, and with renewable cutting edges. A side shift mechanism for the blade is provided.

The lift gear housings of the blade control mechanism are heavy semi-steel castings, machined to be oil-tight and dust-proof, and enclose a set of spur gears ahead of the worm and main gear, thereby obtaining a double reduction.

The steering mechanism is of the positive nut and screw type with ball thrust bearings on the screw. The front wheel equipment may consist of either 36 x 7-inch steel-tired or 36 x 6-inch rubber-tired wheels, equipped with Timken tapered roller bearings. The machine will be equipped in the rear with either heavy 12-inch rubber-tired wheels or Buckeye Alligator crawlers with grousers, these crawlers being made of abrasive resisting and chrome nickel steel.

The operator's position is just ahead of the motor but far enough back from the blade to give an unobstructed view of the roadway ahead and of the entire blade. Every care has been exercised in locating the controls and making them easy to operate so that the machine may be easily operated by one man.

A scarifier attachment may be furnished with the Dreadnaught when required. The tooth bar is made of heavy structural sections securely clamping ten teeth and giving a scarifying width of 55 inches.

Steel cabs with curtains or canopy tops with curtains can also be furnished.

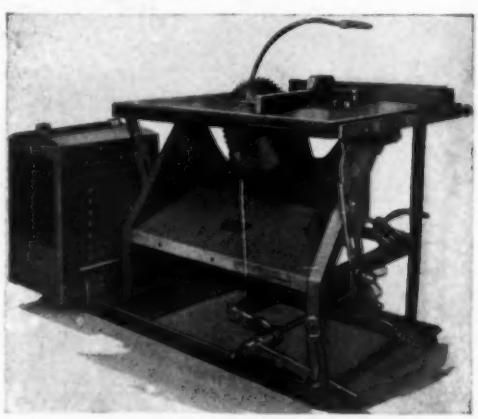
Woodworking Machine Cuts Costs

ANY woodworking operation such as ripping, bevel ripping, straight cut off, mitering, double mitering, dadoing, grooving, rabetting, notching the rafters, etc., is easily accomplished on the Superior Super Woodworker made by the Jones Superior Machine Co., 1258-70 West North Ave., Chicago, Ill. Changing from one operation to another is a matter of but a few seconds.

The machine will rip 2-inch stock at the rate of 45 feet per minute and will cut off 3 x 6-inch pieces in less than 2 seconds. The machine is made of steel throughout so that it is light enough to be readily portable and yet sturdy enough to stand rough handling. A special spring mounting under the gasoline engine eliminates vibration. The woodworker is equipped with a tilting table and a swinging arbor.

An aluminum guard on the machine acts as a splitter knife and can be thrown back and fastened out of the way by a nut. Power for the woodworker is provided by a 4-cylinder LeRoi engine and the machine is equipped with Alemite lubrication and Timken roller bearings throughout.

The ripping gage is adjustable and has both sides planed true so that it can be used on either side of the saw. The guide for the ripping gage extends all the way across the front of the table so that the gage may be placed either to the right or left of the saw blade. When the cut is such that both hands must be kept on the work, the foot lever will be found convenient. After the saw has been brought forward the spring will return it.



The Jones Super Woodworker Equipped with a Tilting Table and Swinging Arbor

HEAVY TYPE Ransome

This plant is being used on a bridge job at Angola, New York

Erection is safer, easier, faster and cheaper

Steel Mast Plant Can be Quickly Easily Economically Erected

The working platform extends around the mast on three sides, and automatic safety latches are always in position when the platform is being hoisted from section to section. > > >

The Ransome Heavy Type Steel Mast Plant can be used with any of the concrete chuting plants commonly used on construction work—counterweight boom chute plant, continuous line plant or the bin plant. > > > > > > > >

Top and bottom sheaves for raising the sliding frame are furnished as standard equipment. A tip-over bucket in two sizes is offered for use with this mast. These are made in 18 and 36 cu. ft. water level capacity for use with 14-S and 28-S Mixers.

Send for Bulletin No. 304.

Ransome Concrete Machinery Company

1850 — Service for 80 Years — 1930

Dunellen **New Jersey**

A Simple Method of Making Positive Black and White Prints Direct from Tracings

THE new BW direct printing process for making black and white positive prints direct from a tracing without the use of negatives or ammonia fumes places a very useful method in the hands of municipal officials, contractors and manufacturers for doing away with blueprints and producing black and white prints with plenty of white space on which to make notes and suggestions for changes in diagrams and plans.

A special sensitized paper which is put up in rolls of 10, 25 and 50 yards in widths of 30, 36 and 42 inches, is run through a standard blueprinting machine of any type with the tracing. Then, if desired, the BW developing attachment may be affixed to the blueprinting machine and produce the prints immediately, or a large quantity of them may be printed in the blueprinting machine and then run through the No. 2831 sheet developing machine.

A BW Motor-Driven Developer for Producing Positive Black and White Prints

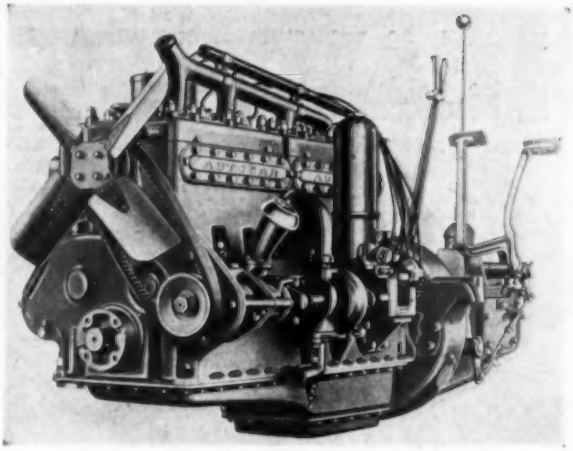
A portable hand developer is also made which can be transported anywhere, but finds its best application in the office or blueprint department where only an occasional print is made. Like the larger machines, it is equipped with a developer tray and roller. A movable bar running the length of the machine serves as a weight on the paper behind the developer roller to insure resistance and contact as the paper is pulled through the machine and over the developer roller.

To develop a BW print in this machine, it is first necessary to fill the developer tray with developing fluid to a point where the bottom of the roller is submerged, give the roller a spin with the finger to cover it with the fluid, lift the bar enough to allow the paper to slip under it, drop the bar back on the paper and pull it through the machine. It develops as it passes over the roller as an instantaneous operation. These machines are manufactured by Charles Bruni & Co., Inc., 102 Reade St., New York.

A New Engine for Trucks

OF interest to truck users is the announcement of a new 6-cylinder motor, known as the Blue Streak, recently developed by the Autocar Co., Ardmore, Pa., to meet the demands of modern hauling requirements of both distance and load. This new Autocar Blue Streak engine is now available in all Autocar chassis of 3 tons rated capacity and over.

This new engine is made in two sizes, 4½ and 4¼-inch bore. The 4½-inch engine develops 101 horsepower, and 4¼-inch engine develops 90 horsepower at 2,000 rpm. One of the outstanding features of this engine is its rigidity. The line of the flange joint between the crankcase and oil pan is dropped to 3½ inches below the center line of the crankshaft, providing a deep stiff case. Further rigidity is obtained by heavy ribs crossing the bottom of the case, tying the crankshaft bearings to the side walls. The cylinder block has been stiffened by extending the water jacket wall to the base of the block. Another factor of the new design is the shortening of connecting rod bearing offsets from the crankshaft center, thus making for greater crankshaft stiffness and producing an actual overlapping of main and connecting rod bearings.



The New Autocar Blue Streak Engine

Other features of this engine are the greater area of cooling circulation, adopting a new principle of water direction; non-expanding and non-corroding nickel chrome iron cylinder blocks and special silchome alloy exhaust valves; a fully screened oil pan, with positive oil circulation enforced by an oil by-pass, which provides against stoppage and freezing.

A Three-Compartment Portable Bin for Aggregates

THE new X-40 three-compartment bin for storing aggregates has recently been announced by the Butler Bin Co., Waukesha, Wis. This bin, which has a total capacity of 40 cubic yards, is divided into three compartments so that the coarse aggregates or rock may be graded in sizes, a requirement made by many state highway departments at this time.

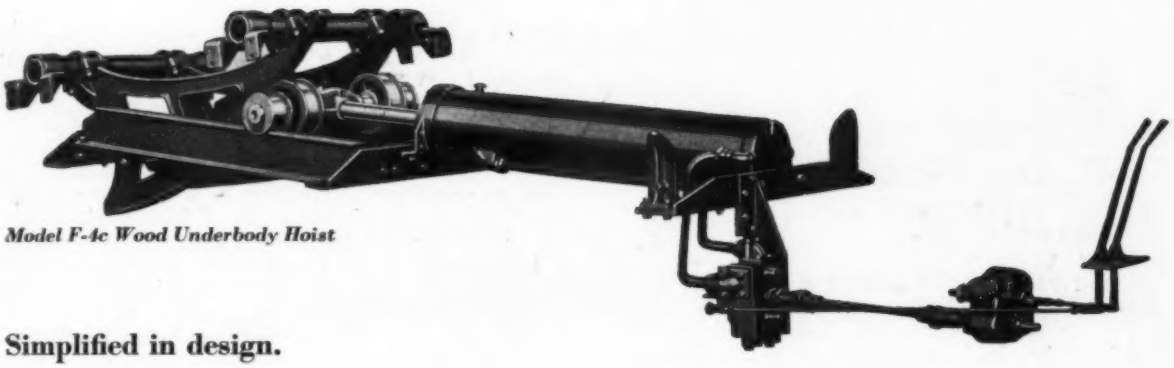
The bin is equipped with the latest type weighing hopper, which has been particularly designed for handling sand and two sizes of graded rock. It is also equipped with a three-beam scale, the hopper itself having three compartments to accommodate the three different sizes of aggregates. The bin may be moved from one set-up to another as a unit without removing the scales or weighing hopper and if desired may be equipped with truck wheels and a frame on which the bin may rest, thus insuring easy transportation.

The X-40 Three-Compartment Storage Bin, Mounted on Wheels for Easy Transportation

BETTER THAN EVER

Improved

7 NEW SLANT TYPE HOIST MODELS ALL-STEEL CONSTRUCTION AND EVEN MORE STAMINA!



Model F-4c Wood Underbody Hoist

Simplified in design.

More compact—Unit Construction.

Slanting position of cylinder gives greater lifting power.

Cylinder supports, front and rear, drop-forged steel.

Lifting force applied to longitudinal members of body sub-frame—strongest part of body.

Cams mounted on special seamless steel tubular supports.

Tubular supports attached to longitudinal body frame members by pressed steel brackets.

Standardized designs, special machinery, skilled workmen, large production, enable us to give dump truck users maximum value in all-steel dump bodies.

Any chassis equipped with a Wood Hoist and a Wood All-Steel Dump Body is a more efficient dumping unit.

WOOD HYDRAULIC HOIST & BODY CO.

DETROIT U. S. A.

Branches and Distributors in Principal Cities

WOOD HOISTS & BODIES

Mixing Concrete in the Truck

THE Highway truck mixer, made by the Highway Truck Mixer Co., 12500 Berea Road, Cleveland, Ohio, is a complete single motored unit for handling concrete from weighing batchers to the job without elevating the body to discharge the batch. The mixing drum is driven direct from the truck motor, and the number of drum revolutions may be controlled for any specified mixing period by a batch meter and lock over which the driver has no control, thus insuring a thorough mix either in transit or stationary mixing.

The gear box is provided with a low speed for mixing in transit, a higher speed for mixing on the job, if required, and suitable reverse speeds for controlling the discharge. The throttle gives a full range of variable control over the drum speed. At the point of delivery the batch is discharged clean simply by reversing the drum. All operating controls are conveniently handled from the driver's cab.

A 3-Yard Mixing Unit Mounted on an International Harvester Truck

A heavy-duty friction clutch controls the drum rotation entirely independent of truck movement, thus eliminating all shock load starting. All starts and gear shifts for truck movement are made with the mixer clutch disengaged. The drum can be engaged at any time during the movement of the truck.

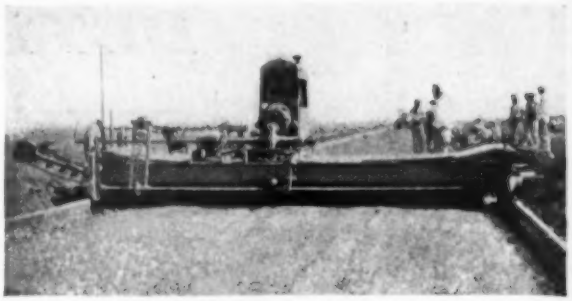
This body is made in several sizes, the 2-2½-yard size being particularly fitted for all classes of commercial concrete service. Where the road load limits prevent the use of the 3-yard and heavier trucks, this unit will prove the most economical for supplying concrete on building construction, foundations, driveways, street and alley paving and highway paving.

This size is speedy and flexible in operation and easy to handle on the job, and has averaged delivery of 40 to 44 cubic yards of concrete in 10 hours, hauling an average distance of 2½ miles.

A New Power Subgrader

A POWER subgrader, recently developed by the Lakewood Engineering Co., Cleveland, Ohio, has been added to its line of subgrading equipment. In addition to preparing fine grade, this subgrader delivers the excess material where it is needed for building shoulders and thus decreasing the cost of this operation. This machine provides a frame which spans the road and which carries a milling cutter consisting of a large number of stellite-tipped steel teeth set in a steel tube, 10 inches in diameter, and arranged for the proper crown of the subgrade which is to be cut. This cutting roller and frame are adjustable for height so as to gage the depth of cut to be made. The roller revolves approximately 150 rpm and the teeth easily break up the material to be excavated which is then picked up by a conveyor and carried to either or both sides of the road and deposited outside the forms.

Power is provided by a 4-cylinder standard motor. Three



A Lakewood Power Subgrader

operating speeds forward, 3, 6 and 12 feet per minute, give the necessary flexibility for the various conditions of cutting that may be encountered. A crown setting template is a standard part of the machine by which the teeth may be accurately gaged for the subgrade being cut. This template allows the contractor to make an instant check on the setting of the teeth at any time.

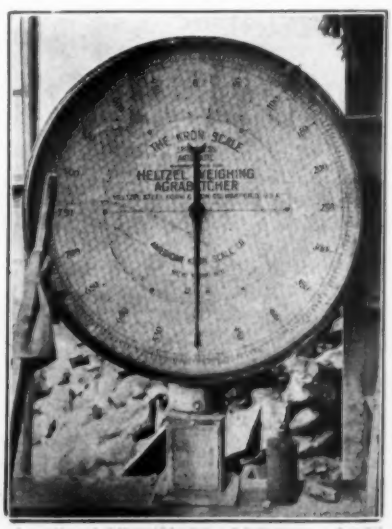
Transportation wheels are also provided, on which the subgrader can be mounted so that it may be lifted off the forms and moved to one side of the road to clear the grade for the passage of trucks. The machine is not restricted to use on jobs where hauling is not done over the grade, but may also be employed with truck haul as well.

A Trailer Type Cement Bin With Weighing Batcher

A TRAILER type cement bin, built in one unit of all riveted construction, which can be readily moved by simply lowering it to trailing position with a crane, is manufactured by the Heltzel Steel Form & Iron Co., Warren, Ohio. This feature of portability makes it possible to move the bulk cement when desired and in no way prevents the bin being used for permanent storage.

The hopper is conical in shape, sloped to an angle of 50 degrees to insure self-cleaning of the bin. It is built of 3/16-inch steel plate and is reinforced to carry a live load of up to 60 tons. The bin cover has a sloping roof and is provided with a manhole. The flow of cement from the hopper to the batching equipment is controlled by a rotary valve. This type of gate is dustproof, making a dust packet unnecessary, and affords the operator positive control.

The capacity of this Heltzel cement bin can be increased or decreased by adding or removing a 9-foot extension. The bin has an overall length and width of 11 feet by 9 feet 3 inches. Without the extension the total height, including the cap, is 24 feet 6 inches, giving the bin a storage capacity of 125 barrels of cement. By



Cement Weighing Agrabatcher with Which the Bin Is Equipped

Make it *minutes*, not *miles* to Market

SEVENTY-FOUR per cent of American farmers still live on dirt roads. Their produce travels to market much more slowly than that of the lucky 26 per cent who live on smooth, modern highways. Waste is greater; delivery later. That means that costs—and prices—are higher, and profits lower.

This farm-to-market road problem can be solved—is being solved by hundreds of communities which have adopted Tarvia "Re-Tread" programs.

Tarvia "Re-Tread" enables any community to have easy-riding, traffic-safe, storm-proof highways—quickly and without excessive taxation. No elaborate organization or expensive equipment is necessary to do a perfect job with "Re-Tread."

The Tarvia field man will gladly give you the details. 'Phone, wire or write our nearest office.

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adding the 9-foot extension, the height of the bin is increased to 33 feet 6 inches and the capacity is increased to a maximum of 320 barrels of cement.

The hopper of the Heltzel cement weighing batcher with which the bin is equipped has a capacity of 13 cubic feet and is sloped at an angle of about 70 degrees to horizontal. It is so constructed as to be dustproof and self-cleaning. The lower gate is of the sliding valve type and fits tightly enough to prevent any loss of cement. A swinging spout 8 inches in diameter at the outlet is used in conjunction with this lower gate. This spout, constructed of 16-gage steel, can be telescoped and revolved so that the outlet can be brought to any point within a 30-inch circle.

The automatic springless dial scale used in conjunction with the batcher makes possible speed and accuracy in the batching of bulk cement. The operator has only to watch the scale dial and as the pointer nears the proper weight marking, gradually shut the upper rotary valve. There are no poises or counterweights to adjust and the operator knows at all times exactly how much cement is in the batcher. The 36-inch dial is easily read, being graduated from 1 to 1,000 pounds in single pound graduations.

A Portable Electric Hammer

THE Speedway portable electric hammer for drilling, chiseling, channeling, tuck-pointing or bush hammering in brick, concrete and stone is manufactured by the Speedway Manufacturing Co., Cicero, Illinois. This hammer is designed for either A.C. or D.C. operation and has its motor fully protected against its own 1,800 blows per minute.

The Speedway Electric Hammer

These hammers have a drilling capacity of 1¼ inches in diameter, weigh 26 pounds, an all-over length of 15 inches and cannot be overloaded. The switch is in the handle, under instant control, and the hammer operates on either D.C. or A.C. and can be furnished in either 32, 110 or 220 volts.

Standard equipment for the hammer includes a rotating wrench, one drill steel and an 8-foot rubber lead cord with soft rubber and indestructible split plug connection.

Standard and Felt-Sided Expansion Joints

SEALTIGHT expansion joints made by W. R. Meadows, Inc., Elgin, Ill., are furnished in two types, standard and felt-sided. The standard joint is more generally used and is recommended for all types of concrete construction where preformed expansion joints can be used. Because of its unusual homogeneity it will very readily conform to expansion and contraction movements, keeping the expansion space properly filled under all conditions. The large percentage of asphaltic content insures durability, and the long fibre makes it tough under heavy usage, giving a minimum of oozing after installation, even under high temperature conditions.

The felt-sided expansion joint is especially advantageous where rather thin fillers are specified. Upon both sides of a core of regular Sealtight expansion joint material are laid strips of asphalt-saturated felt. The method of construction used makes it extra strong and rigid, so that even in thin strips it can be handled without difficulty.

Both types are made in all regular thicknesses and sizes, the cost for both being the same. The standard type is recommended for use where thicker joints from ½-inch up are specified.

Sealtight Expansion Joint as Used in Curb and Gutter Construction

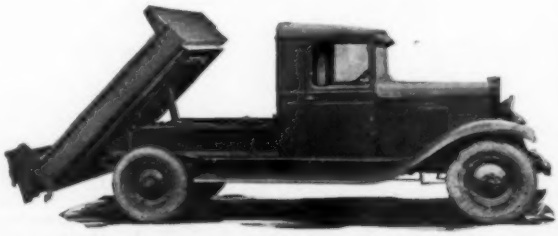
It is just as essential to provide for volume changes of materials in the construction of paved yards and similar areas as in roads, streets and alleys, although the total length of the single job may not be so great. The necessity is further emphasized sometimes by the presence of other structures enclosing the area with foundations closely abutting, so that when expansion does occur, if there is no provision made somewhere in the area, heaving or buckling is certain to develop. Recommended practice is to insert ½-inch expansion joints at intervals not exceeding 15 feet both lengthwise and crosswise. The expansion joint should extend clear through the paving material, and be placed so as to be held perpendicular to the slab surface. A ½-inch expansion joint should be inserted around all manhole covers, catch basins, columns and other structures which protrude through the pavement. A section of premoulded joint filler held in place with a strand of light wire is best.

A New Mechanical Power Hoist

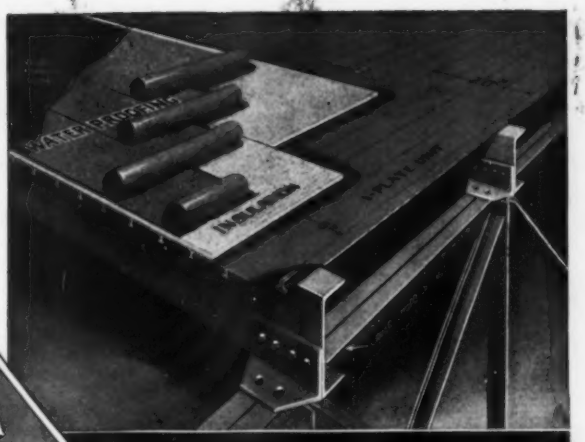
A NEW mechanical power hoist, which dumps the full load in about 6 seconds and returns the body to full loading position in the same length of time has recently been announced by Hughes-Keenan Co., Mansfield, Ohio. This hoist, the construction of which gives a low loading height, a 45-degree dumping angle and ample rear dumping clearance, operates through a special worm and gear. It is strong and sturdy and handles a full load without strain on the truck or body.

The body is made of No. 10 gage steel plate, electrically-welded with the sides and bottom in one piece. An adjustable automatic lock, which holds the body in loading position, is released automatically as the body dumps. Two special supports at the front end for use when the body is in loading position relieve the hoist from all strain.

This power hoist dump is made in 1 and 1½-yard sizes, each capable of handling 2 yards when full. A plain double-acting tail-gate is standard equipment and the power take-off and all parts necessary for mounting are supplied with hoist and body.



A Hughes-Keenan Dump Body and Mechanical Power Hoist Mounted on a Chevrolet Truck



Standardized Buildings

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Pitched Roof Types

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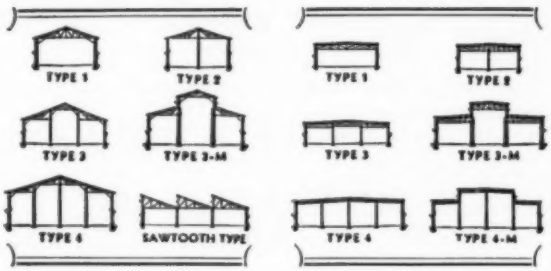
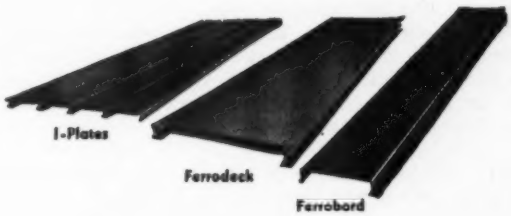
Flat Roof Types



INSULATED to any Degree and WATERPROOFED



All types and sizes—built of standardized units combined to meet exactly individual requirements. Flat, pitched, monitor, lantern or sawtooth roofs—steel windows, steel doors and insulated Steeldeck roofs. Permanent, quickly erected and economical in cost. Our Engineers will study your needs and give suggestions without obligation.

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SAVE WITH STEEL

Spraying R-B Silicate of Soda on a Green Concrete Base

Silicate of Soda for Curing Concrete Highways

SODIUM SILICATE or silicate of soda, as it is known to the technical man, is manufactured by fusing a good quality of white sand with soda ash. The result of this fusion is a glass-like product but unlike ordinary glass, it is soluble in water under high pressure and temperature. Different proportions of sand and soda ash change its chemical and physical properties and produce a number of grades of the chemical.

Grasselli R-B silicate of soda, made by the Grasselli Chemical Co., 629 Euclid Ave., Cleveland, Ohio, is a syrupy liquid which is applied to the surface of the concrete and not used as an admixture. It is shipped in 50-gallon steel drums having side and end outlets and holding approximately 610 pounds, one pound being required to cure one square yard of concrete.

Concrete properly protected with wet burlap should be treated not later than 10 A. M. of the day following the placing of the concrete and the burlap should be removed just prior to the application to minimize the evaporation of water from the concrete. No covering or sprinkling is required and a second treatment is not necessary unless a rain occurs within 6 hours after it is applied.

An oil or molasses gate with straight shank, two-inch nipple or a sharp-pointed plug to remove the silicate of soda from the drum, two 10-quart buckets to transfer the solution from the drum to the mixing barrel and for slushing it onto the road, a mixing barrel with cart attachment for hauling the solution to the place of use, and one or more soft hair push brooms for spreading the mixture uniformly, are the equipment needed for slab work. For curing concrete bases, the same equipment is required with the exception of the brushes. Instead of these an ordinary fruit-tree spray can be used as shown in the illustration. The only change necessary in the spray equipment is to increase the orifice in the nozzle to ⅛-inch diameter.

Connecticut Changes Road Roller Specifications

THE Connecticut State Highway Department has issued a notice to contractors covering the weight per inch-width of the rear wheels. The notice calls attention to the fact that the use of gas rollers by contractors is becoming quite common and because of the wide differences among the various manufacturers in the width of the rear wheels with respect to the total weight of the rollers manufactured, the Department has considered it advisable to prepare for a change in the specifications which will probably require a weight of 500 pounds per inch-width of rear wheels. Contractors should bear this in mind in purchasing new equipment for Connecticut contracts.

A New Four-Cylinder Industrial Engine

THE Model BC Fuller & Johnson 4-cylinder 6 to 10 horsepower industrial engine, the design of which closely follows high compression automotive power units, is one of several new vertical engines which have recently been developed by Fuller & Johnson Mfg. Co., Madison, Wis. These engines are adaptable for operating concrete mixers, conveyors, air compressors, sprayers, centrifugal, rotary and power force pumps and similar uses.

These multi-cylinder vertical engines can be equipped with electric starters of the automotive type. The generator charges the 6-volt battery which supplies current for the starting motor and also for the lights on the machine. The arrangement is simple, compact and easily accessible.

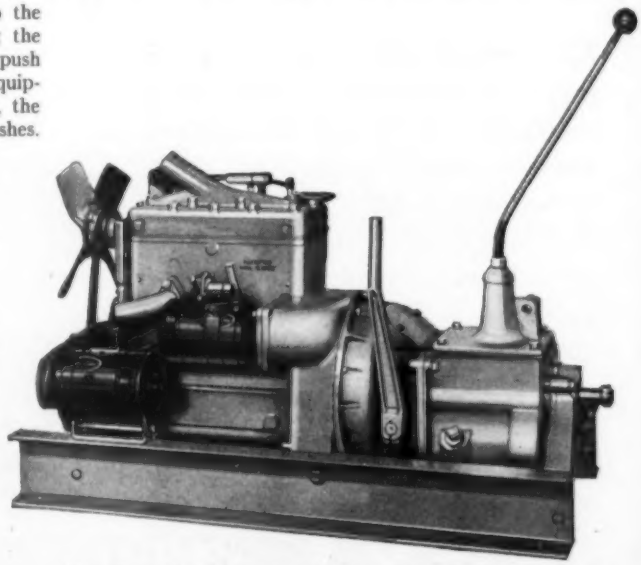
The BC unit is furnished with the accessories, namely the magneto, carburetor, etc., on the right or left hand side of the motor. The drop-forged heat-treated heavy crankshaft is accurately balanced and carried on two large ball bearings. Model BC can be equipped with or without a clutch. When equipped with the clutch, it is fitted with ball bearings on the power take-off end and is fully enclosed.

The illustration shows the Fuller & Johnson, 4-cylinder Model BC, 6-10 horsepower industrial power unit with variable speed transmission—three speeds forward and one reverse. The fully enclosed dry disc type clutch is mounted on the main shaft operated at engine speed. The clutch can be equipped with hand lever or foot pedal.

This unit is designed for operating industrial trucks, small excavating machines, conveyors, small tractors, and other jobs where variable speed is essential. The transmission is sturdily built and permits continuous operation in first and second gear without undue strain or wear on the working parts and with a minimum of noise.

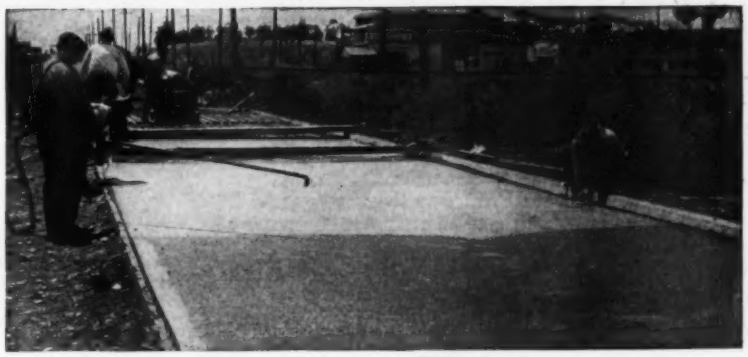
This Model BC engine can be equipped with a smaller transmission for use where continuous operation in first or second gear is not required.

A large radiator is furnished as regular equipment. The over-size four-blade fan carried on an aluminum hub mounted on ball bearings can be lubricated while the engine is running. The engine is protected with a heavy gage steel house which measures 25 inches long, 17 inches wide and 29 inches high.



The New Fuller & Johnson Four-Cylinder Industrial Engine

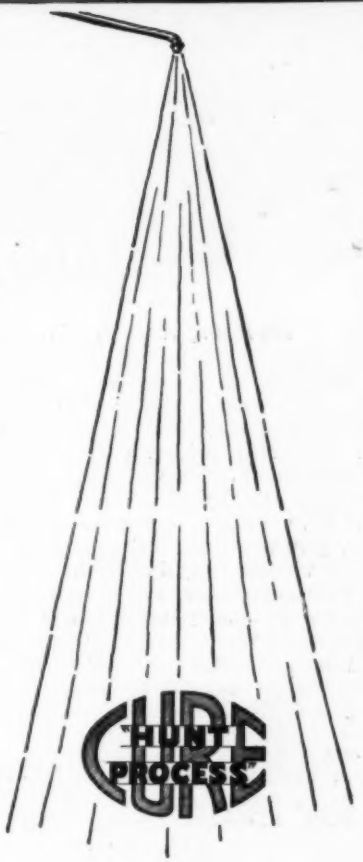
With This Better Method~



You Can Spray It then *Forget* It!

ONLY one simple operation is needed when you cure concrete with the "Hunt Process"—the modern method of internal cure. There is no need to go back over the job again and again to fill the dikes or to wet down the earth cover. The entire curing process—so far as you are concerned—is completed when the mixing water has been sealed into the concrete by the airproof and waterproof film of "Hunt Process." As the cure progresses, this film hardens and adheres closely, practically becoming a part of the concrete without penetrating into it.

Curing need no longer be a matter of controversy between the engineer and the contractor. Literally, you can spray the concrete and then forget it. With the mixing water sealed in, the process of hardening goes forward under ideal conditions. "Hunt Process" jobs are completed when the last square yard of concrete has been sprayed.



The "Hunt Process" is good for any form of concrete work including dams, pipes, bridge abutments, retaining walls and similar structures. A helpful booklet telling you in detail how you may benefit from this better method of curing is ready to put in the mail. The coupon will bring it.

McEVERLAST, INC.

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OFFICES IN PRINCIPAL CITIES

I want further information on this better method of curing.

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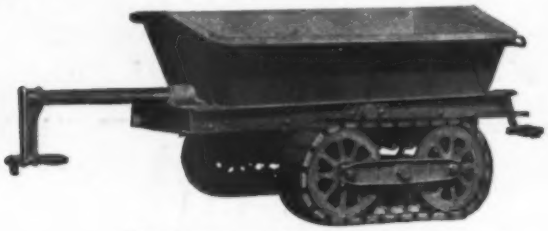
C.E.M.-4-30

A New Line of Crawler Type Dump Wagons

A NEW line of dump wagons, known as Davenport Cat-Tread wagons, and adaptable for use on all types of earth-moving operations where loading is done with power shovels or elevating graders, is manufactured by the Davenport Locomotive & Manufacturing Co., Davenport, Iowa. These wagons are designed for use with tractors of the crawler type and the large supporting area of the Cat-Treads combined with the use of Timken bearings in the wheels, make it possible to haul full loads with minimum tractive effort under the most adverse conditions.

Davenport Cat-Tread wagons are made in two sizes of 5- and 7-cubic yard capacity. The 5-yard wagon weighs 8,400 pounds and the 7-yard wagon approximately 10,500 pounds. The capacities of both wagons are based on level measure and may be increased from 1 to 2 cubic yards by the application of an auxiliary side board which may be readily fitted to the low side of the dump body.



The Davenport Cat-Tread Wagon

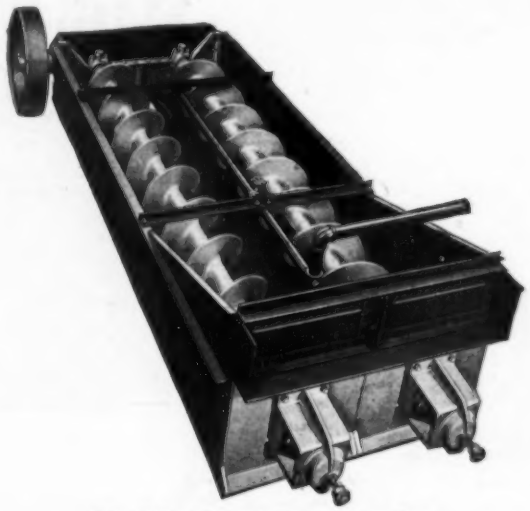
The main frame of the wagon is a 9-inch ship channel which provides maximum rigidity of the dump body. The axle hanger is an alloy steel casting riveted to the frame channel. To prevent bulging, a tie rod extends across the frame and is secured to the axle hangers. A simple and easily-operated dumping and wind-up device is located at the rear of the wagon, which is bottom-dump. The dump doors drop vertically, permitting free discharge of the load and non-interference with the dumped material.

Among the special features of these wagons are its rugged assembly, the special analysis steel used in the tread assembly and the one-piece wheels which carry the treads assembled in a rugged H-frame which is claimed to keep the wheels in alignment and prevents twisted axles when operating over uneven ground.

A Twin-Screw Rewasher for Sand and Gravel Plants

THE Telsmith twin-screw rewasher for washing sand and gravel is manufactured by the Smith Engineering Works, Milwaukee, Wis. This rewasher consists of twin screws, journalled in an inclined metal trough. The screws are made in sections, threaded upon a 2-15/16-inch shaft of cold rolled steel which is driven by means of bevel gears at the upper end. At the lower end, the shaft is provided with a roller bearing, completely housed, to take the end thrust. An adjustable stuffing box prevents leakage of the water around the shaft and a flush chamber at the inner end of the bearing provides a counter-flow against the entry of dirt into the journal.

The screws keep such materials as clay, dirt, bark, leaves and trash in suspension, while the spray prevents their working upward along the screw and they are finally eliminated. The discharge opening is central of the trough but a low enclosure prevents the discharge of all but dry aggregate.



The Telsmith Twin Screw Rewasher

This device is commonly used in gravel pits to remove excess dirt from either sand or pebbles but is also useful in quarries or pits where seams of clay occur and make washing necessary.

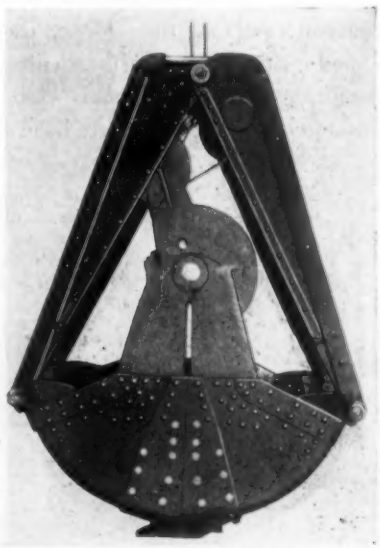
The Telsmith twin screw rewasher is 57 x 12 inches in size, with a capacity for sand of 50 to 60 cubic yards an hour and for gravel of 60 to 80 cubic yards an hour.

More Digging Power in This New Bucket

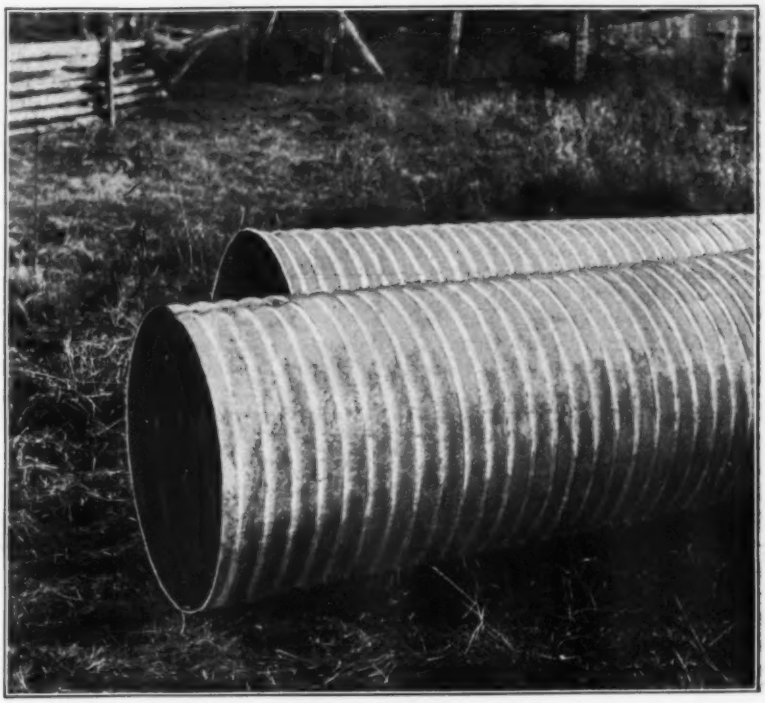
BUCKETS made by the G. H. Williams Co., Erie, Pa., have been noted for their narrow head construction which is said to give greater rigidity. The improved head of the new Williams Champion excavator bucket is even narrower than on past Williams buckets. This has been accomplished by attaching one pair of corner bars to the rolled steel head plate, instead of carrying them right up to the bearing pin. A much larger guide sheave has also been used and the cable is guarded at the head by improved transverse rollers. This new bucket is made in sizes from ¾-yard up.

The manufacturers claim that tests of the new bucket have shown 25 to 30 per cent greater digging power than other buckets of the same size. To produce this great digging power, the lever arm principle has been combined with multiple reeving of the closing line and other features of construction give the bucket exceptional rigidity and digging power.

The improved Favorite bucket is specially designed for rehandling concrete road materials.



A Williams Champion Excavator Bucket



In ground 20 years — still "almost perfect."

Section of GOHI Corrugated Culvert installed in Putnam County, Tenn., in 1909.

How Long Will . . .

Corrugated Culverts Last? . . . *Nobody Knows!*

NO one knows now and probably no one will know for another fifty, seventy-five, or more years. But the service given in thousands of installations like the above points conclusively to a life far beyond the time when erosion and other natural forces will make re-location of the drains a necessity.

GOHI Corrugated Culverts are made of GOHI Genuine Open Hearth Iron which is guaranteed 99.90% pure Iron-Copper alloy. This material has the highest resistance to corrosion of any present-day culvert metal. Its durability is a fully established and demonstrated fact.

GOHI Corrugated Culverts have the strength to withstand any traffic conditions — the flexibility to prevent cracking from settling earth or freezing water. No repairs, no upkeep. Easily installed between sunup and sundown. Specify "GOHI Corrugated Culverts" for lowest-cost-per-year service and freedom from culvert troubles.

(Meet copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

Here's Durability Proof

"In 1909, 1910, and 1911, as Secretary and Purchasing Agent for the General Road Commission of Putnam County, Tenn., I bought our culverts from the Newport Culvert Company. At that time they were known as Genuine Open Hearth Iron Culverts. I have today (October 18, 1929) in company with others, examined some of these culverts and found them almost perfect.

"A section of one of the culverts was removed in my presence, and upon inspection was found seemingly with no deterioration after twenty years of use."

(Signed) JAS. N. COX

© 1930, G. C. M., Inc.

GOHI CULVERT MANUFACTURERS, Inc., Newport, Ky.

Denver Steel & Iron Works Co.
Denver, Colo.

A. N. Eaton, Metal Products
Omaha, Nebr.

Feenaughty Machinery Co.
Portland, Oregon

Lincoln Steel and Forge Co.
St. Louis, Mo.

The Newport Culvert Co.
Newport, Ky.

The Pennsylvania Culvert Co.
Philadelphia, Pa.

Roanoke Sales Corp.
Roanoke, Va.

St. Paul Corrugating Co.
St. Paul, Minn.

Tennison Brothers
Oklahoma City, Okla.

Tennison Brothers
Texarkana, Ark.

Capital City Culvert Co.
Madison, Wis.

Central Culvert Co.
Ottumwa, Iowa

A Littleford Motor-Driven Hand Spray Attachment on a Trail-O-Heater

Hand Spray and Power Attachment for Asphalt Kettles

IT is now possible to use tar and asphalt kettles to the fullest extent as conveyors for asphalt to be sprayed onto patches on roads. Littleford Bros., 485 East Pearl St., Cincinnati, Ohio, has developed a hand spraying attachment which consists of a rotary gear pump, an easily operated hand crank, intake pipe with filter screen, a 15-foot highly insulated flexible metal hose and a spray bar with a removable tip.

The spray bar has a spray tip which can be adjusted to make either a forward or crosswise fan-shaped spray perfectly suitable for penetration and skin patching or similar work. This spray tip can be easily removed and a round hole nozzle used for expansion joint and crack filling. At slight additional charge, a swirling high pressure nozzle can be furnished.

The pump is located at the bottom of the melting tank and is completely submerged in hot material. Hence it cannot clog. The filter at the intake prevents foreign material from entering the pump. The flexible metal distributing hose is so insulated that the material will not congeal in it.

A new motor driven attachment eliminating all labor in connection with the operation of the pump and increasing the efficiency has been developed. It consists of a 1-horsepower Briggs & Stratton engine to operate the pump. The pump is equipped with a pop-off valve making it unnecessary to shut off the engine every time the nozzle is closed.

A New Asphalt Emulsion

A PURE bitumen emulsion having the color of chocolate and the consistency of coffee, and known as Bitumuls, is made by the American Bitumuls Co., 503 Market St., San Francisco, Calif. It is composed of pure bitumen held in suspension in water by a small amount of neutral emulsifying agent. It is used cold and remains fluid in storage for many weeks. After application to the road, however, it breaks down in a few minutes, forming a uniform black coating of the same sticky asphalt which was emulsified.

Applying Bitumuls H as Binder to an Old Concrete Base, Preliminary to Resurfacing with 2½-inch Asphaltic Concrete Wearing Surface

By the use of Bitumuls, pure asphalt of the desired penetration can be handled cold and applied with simple equipment. Due to its fluidity it will penetrate and coat all particles with a thin coating of pure bitumen. It does not chill or coagulate from the cold and can be used in any except freezing weather. Since the presence of moisture assists adhesion to the road, it may be used in damp or even mildly rainy weather.

Bitumuls is supplied in three different grades to meet the requirements of various types of road construction. Bitumuls L is made from liquid asphalt and fluxes and is suitable for surface treatments, for the construction of penetration surfaces to carry medium heavy traffic and for repair and maintenance work. Bitumuls H is made from pure asphalt of high ductility and purity for use as a binder for penetration macadam construction and repair work. Bitumuls M has a retarded breakdown point and is made for mixing directly into gravel or crushed rock roads by means of harrows and graders, or for pre-mix patch or construction work. Special equipment is not necessary as application may be made by means of ordinary pouring pots and with most types of gravity or pressure distributors.

A New Series of Gasoline Engines

A NEW series of gasoline engines operated at higher speeds and with many features that will appeal to road contractors, has been announced by the Buda Co., Harvey, Ill.

Some of the important features of these new engines are crankcase ventilation which relieves crankcase pressure and aids in preventing oil leaks, specially designed dirt-proof breather and oil filler cap, crankcase and cylinders of chrome nickel alloy iron and a main oil distributing line which is rifle-drilled the full length of the crankcase, eliminating loose oil pipes.

The new engines have 7-bearing, close-coupled crankshafts of large diameter to withstand excessive shocks and permit of smooth operation, a high velocity combustion chamber of new and advanced design, large capacity high velocity water pump, with stainless steel shaft and leak-proof bearing and safety legs on the engine housing to prevent breakage of the engine housing or crankcase by extreme impact on the front of the frame. They are equipped with a high velocity lubricating system and all main bearings, upper and lower, are replaceable without removing the crankshaft. A removable cover is provided for the cylinder water jackets to permit removing corrosion or deposits around the cylinders.

A Correction

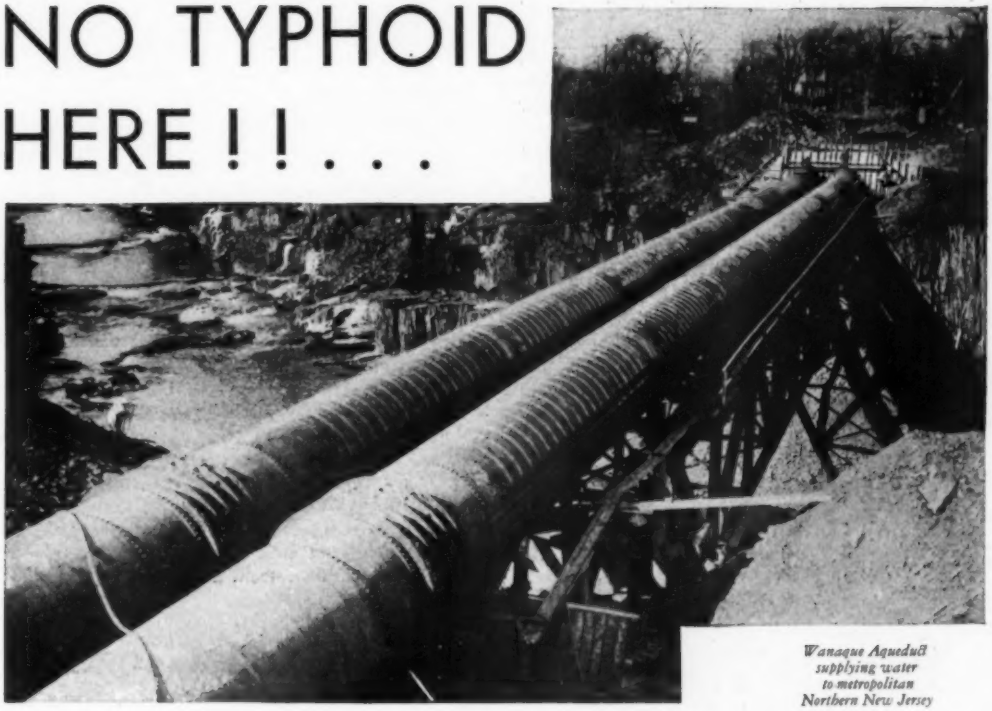
IN describing the Homelite portable blower in the March issue of CONTRACTORS AND ENGINEERS MONTHLY, there was an error which should be corrected. The capacity of the unit, which is operated by a 1½-horsepower engine at 1,800 rpm and weighs only 75 pounds complete, is 3,000 cubic feet per minute and not 7,000 as previously stated.

Road Worker Returns Overpayment

A RECENT Associated Press report calls attention to the honesty of a road worker in Montana which would have saved Diogenes a lot of bother and Athens' streets much wear and tear if the worthy Greek could have lived several centuries later.

It seems that Marshal C. McEwen of Lewiston, Montana, recently returned a check for $80 sent him by the Montana Industrial Accident Board for expenses as the result of being injured by road grading machinery. McEwen wrote, "My expense was only $20. I am recovered and am working."

NO TYPHOID HERE ! ! . . .



Wanaque Aqueduct supplying water to metropolitan Northern New Jersey

W. & T. Portable Main Sterilizers Will Chlorinate

A HUNDRED MILLION GALLON CONDUIT

Twenty-nine billion gallons of water are stored in the man-made lake at Wanaque, New Jersey. One hundred million gallons of water a day will be distributed to Newark and other cities in metropolitan North Jersey through a twenty-five-mile steel conduit. Before this water could be distributed, the State Department of Health required that the conduits be sterilized—a proper health regulation.

Again, through the use of W. & T. Portable Main Sterilizers, W. & T. helped to safeguard a great water works project—and incidentally four W. & T. Automatic Vacuum Chlorinators will sterilize every drop of water that comes from the Wanaque Reservoir.

"The Only Safe Main is a Sterilized Main"

W & T

WALLACE & TIERNAN

COMPANY, INCORPORATED

Manufacturers of Chlorine Control Apparatus

NEWARK - - - NEW JERSEY

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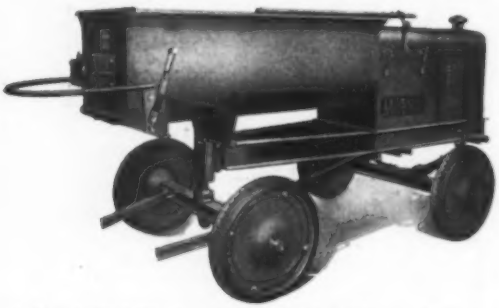
An End-Discharge Mortar Mixer

AN end-discharge non-tilting mortar mixer, of all steel construction throughout and mounted on steel disc wheels equipped with roller bearings and demountable solid cushion rubber tires, is manufactured by the Leach Co., Oshkosh, Wis. It is powered by a 4-cylinder, 9-horsepower Fuller & Johnson engine with power take-off and clutch, fully enclosed.

The unit consists of a large mixing tub of 13-cubic foot capacity in which thirty forged steel paddles bolted to a square shaft insure speedy and thorough mixing. There is a convenient spray water arrangement and a special patented discharge at the end for holding a quantity of mixed mortar ready for quick dumping into a wheelbarrow. The discharge door is easily operated and does not leak.

This mixer is built in the 2-wheel trailer and 4-wheel types, is 109 inches long, 34 inches wide in the narrow type and 54 inches wide in the standard type and 50 inches high. It has three-point suspension and is spring equipped at all three mountings with snubbers on the rear springs. Its weight complete with the engine is 1,675 pounds.



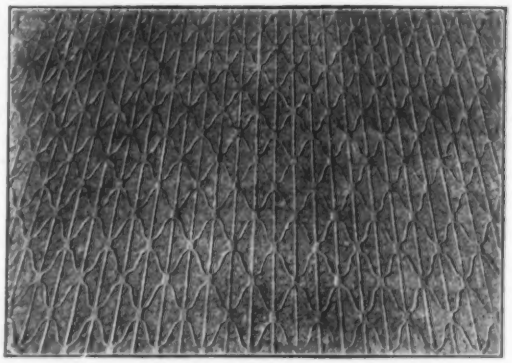
A Leach End-Discharge, Non-Tilting Mortar Mixer

Continuous Armoring for Industrial and Bridge Floors

THE floors of foundries and industrial plants where small hand trucks are continually pushed about, as well as as the floors of bridges, receive very intense wear. It is a well known fact that the floors of bridges have to be replaced many times before any thought is even given to the replacement or reinforcing of the structural members. Planking, wood block, asphalt surfacing and concrete are all quickly damaged through creeping or the inevitable vibration of the structure.

Many forms of reinforcing have been devised for asphaltic and concrete flooring but many of them have failed because of the lack of continuity in the reinforcing itself. A unified construction of the steel structure or reinforcing over the entire armored surface is absolutely necessary so that there can be no opportunity for rolling or other impact to start looseness and play at any point. Continuous floor armoring such as that developed by the Irving Iron Works Co., Long Island City, N. Y., makes an abuse-proof industrial floor and a long-lived sturdy bridge floor, the evenness of the surface of which is inherent in its design and not at all dependent upon super care of installation.

An Irving armored floor is smooth because the surface is that of the armoring itself which latter presents a true top surface because its method of fabrication insures the top of every bar being absolutely flush with the top of every other bar. The patented Streamline joint does away with all butt joints and unsupported bar ends or panel edges which might vibrate under impact. In this flooring straight bars alternate



Irving Continuous Floor Armoring

with reticuline bars of somewhat lesser depth, assembled and riveted together with all edges flush on one face of the assembly. This forms a trussed steel structure having a greater load carrying capacity per unit of weight than any form of grating, according to the statement of the manufacturer.

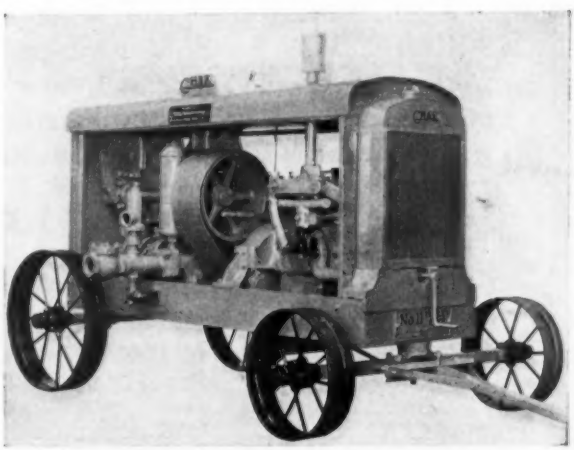
After the grating has been set to the proper elevation and the proper grade of the finished surface and the concrete poured, the grout may be brushed out slightly to give a slight concave surface between the steel bars thus providing a non-skid surface particularly at points where there may be danger of saturation of the floor from grease or slippery industrial materials.

A New Model Road Pump

A NEW model Triplex road pump, among the features of which are the Texrope drive, drop forged crankshaft, roller bearings, steel gears enclosed and running in oil and easily accessible valves, has recently been developed by the C. H. & E. Division, National Equipment Corp., Milwaukee, Wis.

The Texrope drive is a simple and economical one consisting of sheaves and twelve V-shaped Texrope belts. Power is transmitted by the wedging contact between these belts and the V-shaped grooves in the sheaves. The crankshaft is drop forged and of ample size to conform with the balance of this outfit. Roller bearings are used for the crankshaft and countershaft to eliminate undue friction. Gears are steel, machine cut, enclosed and running in oil. The water box, suction and discharge valve manifolds are cast in one piece. Special metal valves, each of which has an individual cover held down by a clamp, are easily accessible.

A 35-horsepower heavy-duty Waukesha engine with clutch



The New Triplex Road Pump

A new measure of "a day's work"

THIS New England crawler type loader sets a new standard of efficiency in the handling of sand, gravel and stone in large quantities. Speed in loading, speed in transportation and one-man operation cut loading costs to a minimum.

Built throughout with the best materials this machine will give you continuous, efficient service for many years, under the most difficult circumstances.

As pioneers in the manufacture of material handling equipment we would appreciate the opportunity of letting our experience be your guide in pointing out the most economical method of doing your particular job. We have done it for others—we can do it for you.

NEW ENGLAND ROAD MACHINERY CO.

Manufacturers of Power Loaders, Crushers, Screens, Washers, Elevators, Feeders, Conveyers, etc.

Write for catalog of the equipment of particular interest to you.

163 C STREET SOUTH BOSTON, MASS.

Two months loss NO HANDICAP

Other Hughes-Keenan Products

1 and 1½ yard gravity, hand and power hoist dumps for standard trucks, also Roustabout tractor cranes. The new Hughes-Keenan Power Glider Dump—a mechanical power hoist body that's unusually low in price and which embodies a new and remarkably efficient dumping action, is 1930's most remarkable dump body. Check coupon below, if you would like literature describing these.

IF up till now your dirt-moving profit has been little or none, Hughes-Keenan "Iron Mules" can still make 1930 your most profitable dirt-moving year. Two unprofitable months are no handicap for these hustling 2 and 4-yard tractor dumps with front-end drive.

Tear out and mail coupon. It will bring descriptive folders about this all-weather dirt-mover that hauls bigger daily yardages than trucks and teams—that builds its own road and dumps over fills without having to back up.

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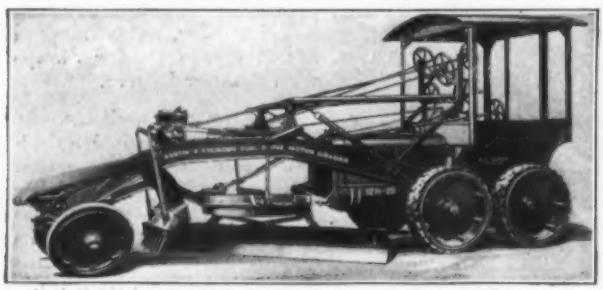
provides the power. This outfit has a capacity of 80 gallons per minute, with a maximum pressure of 500 pounds, or equivalent head of 1,157 feet. It can also be furnished to deliver 100 gallons per minute with maximum pressure of 400 pounds, or 125 gallons per minute with a maximum pressure of 300 pounds. The complete machine is mounted on a welded steel truck frame, with wide faced wheels, and is totally enclosed with a steel house which can be locked.

A New 12½-25-Horse-Power Grader

THE new Austin 12½-25 dual drive motor grader recently announced by the Austin-Western Road Machinery Co., 400 N. Michigan Ave., Chicago, Ill., has all the features of the 10-20 and 15-30 models as well as several features of its own, including a 6-cylinder motor and a unique type of driving mechanism of remarkable efficiency.

The new model is engineered to utilize the full power of its heavy-duty, 6-cylinder motor, sufficient ground clearance being obtained by using 12-inch tires on all four drive wheels with sufficient weight carried on these wheels to insure operating efficiency. Flexibility is provided by locating the differential shafts midway between the front and rear pairs of drive



The New Austin-Western 6-Cylinder Dual Drive Motor Grader

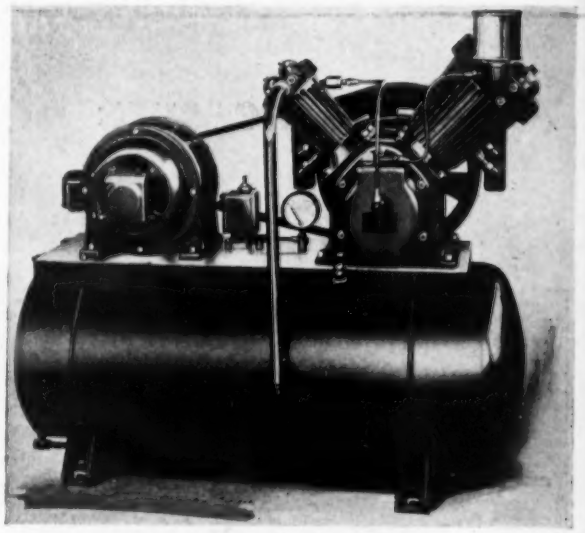
wheels and mounting the right and left head drive wheels separately on side arms which are pivotally connected to brackets enclosing the differential driving shafts.

The screw-type blade lifting mechanism retains the butterfly or bell crank but instead of the old open gear pull rod there is now an enclosed screw operating in self-aligning Timken bearings which makes the raising and lowering of the blade much easier. The blade raising rods have adjustable ball and socket connections at both ends.

The cast steel circle is all in one piece and is accurately finished on the top, bottom and inside of the ring, permitting very close adjustment of the gooseneck and castings that hold the circle in place. The circle is provided with a simple latch which is very strong, operates easily and always remains locked until an adjustment is to be made. There are five teeth in engagement at all times.

A New Line of Air-Cooled, Two-Stage Air Compressors

A NEW line of air-cooled, two-stage air compressors, known as Type 30, has recently been announced by Ingersoll-Rand Co., 11 Broadway, New York. These units are self-contained, the motor and compressor being mounted on a steel base, which is attached to the top of the air receiver. The latter, which is made of heavy pressed steel, is built to withstand a working pressure of 200 pounds. With this arrangement no special foundation is required. The compressor is ready to operate as soon as the connections to the motor have been made and the crankcase filled with oil.



The Ingersoll-Rand T-30 Compressor

The intercooler is located behind the fan-type flywheel, and a constant current of circulating air is driven directly across the cooling coils. Automatic start and stop control, furnished as standard equipment, operates independently but in conjunction with the unloader. When the pressure in the air receiver reaches a point at which the regulator is set to unload, the motor is automatically shut off. A centrifugal governor allows the air in the high-pressure cylinder and intercooler to exhaust through the crankcase, thus preventing the compressor from starting against a load. Honed cylinders and two oil control rings reduce the oil in discharge air to a minimum.

The case of the compressor unit forms a reservoir for the oil and no oil pump is required. A bayonet gage gives positive indication of the amount of oil in the reservoir. A self-cleaning air cleaner keeps dirt out of the compressor, which is enclosed.

It is built in four sizes, ¾, 1½, 3 and 5 horsepower. All sizes are built for a working pressure up to 200 pounds continuous duty.

Four 56-S Mixers for Bagnell Dam Job

FOUR 56-S 2-cubic yard tilting mixers were recently completed by the T. L. Smith Division of the National Equipment Corp., Milwaukee, Wis., for pouring concrete on the new Bagnell Dam project at Osage River, 40 miles from Jefferson City, Mo. This immense project, which will require 550,000 cubic yards or 1,100,000 tons of concrete, will take two or three years to complete, is being built by Stone & Webster for the Union Electric Co. of St. Louis, a subsidiary of the North American Co.

A few of the other important dam jobs on which Smith mixers were used because of their adaptability for long steady concrete pouring include the Wilson Dam, Conowingo Dam, Coolidge Dam, Pardee Dam, Roosevelt Dam and the Exchequer Dam.

The Four 56-S Mixers Being Shipped from the Factory for Use on the Bagnell Dam